BRIDGE AND BUILDING CONVENTION NUMBER

Railway Maintenance Engineer

e 13 CHICAGO: Transportation Building NEW YORK: Woolworth Building NOVEMBER, 1917 CLEVELAND: Citizens' Building WASHINGTON: Home Life Building Number 11

"I am sure that if each track foreman would read and study carefully the meaning of the very interesting items I find in reading through the ***RAILWAY MAINTENANCE ENGINEER****, it would enable each of us to render more and better service for his company. As labor is very scarce and the cost of material is very high, each foreman should use good judgment in handling both men and material."*

From a letter from Earl Gentis, Extra Gang Foreman of the Cleveland, Cincinnati, Chicago & St. Louis Railway at Cincinnati, Ohio.

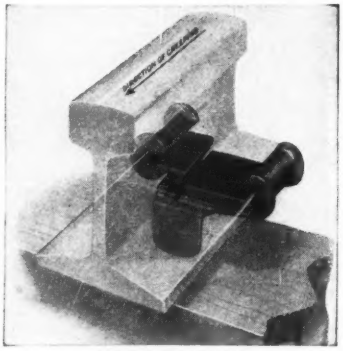
FROGS — SWITCHES — STANDS

Manganese and Built-Up Construction

IN STOCK for IMMEDIATE SHIPMENT

THE INDIANAPOLIS SWITCH & FROG COMPANY

NEW YORK SPRINGFIELD, OHIO CHICAGO



THE P. & M.

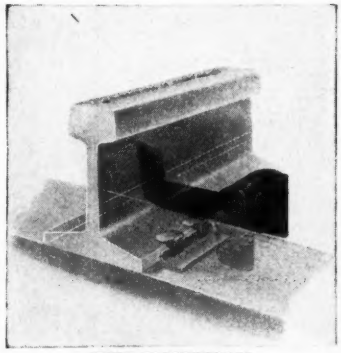
RAIL ANTI-CREEPERS

EFFECTIVE — EFFICIENT
UNIVERSALLY USED

THE P. & M. CO.

RAILWAY EXCHANGE
CHICAGO

NEW YORK ST. PAUL SAN FRANCISCO DENVER



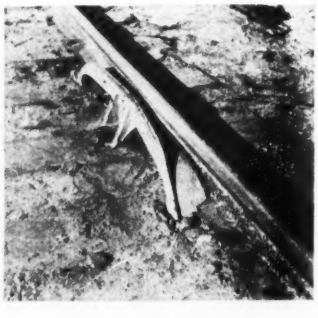
THE VAUGHAN

ESTABLISHED 1882

THE WEIR FROG CO.

Track Work of Rail and Manganese Steel Construction

CINCINNATI --- --- --- --- --- OHIO



Note the foot guard and the wearing insert. Weight 80 lbs.

Tailor Made

GUARD RAILS

To suit your special requirements,
for less money than you are now paying.

WRITE FOR CATALOGUE

National Steel Products Co., Inc.

Ensley, Alabama

For Your Recalcitrant and Peripatetic Crossing Frogs

USE

INTERNATIONAL
STEEL CROSSING FOUNDATIONS

When all other remedies fail order a real cure not a make shift. Six years of experience in designing and building a structural steel foundation which will stand up under the severest service insures the results we claim for them.

More than 500 crossing frogs located on the important steam railroad trunk lines are driving home the fact that these foundations cut maintenance and prolong built-up crossing frog life. They pay for themselves in a few years by the savings they make possible.

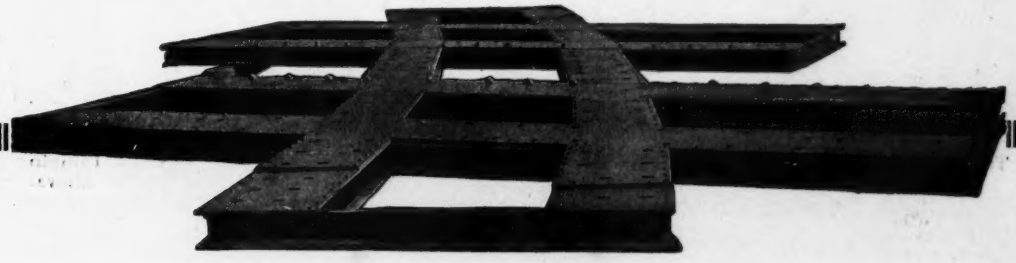
Let us show you how it is done. Send us your crossing frog details today. We have a large stock of low priced steel on hand which insures a moderate price and prompt delivery.

The International Steel Tie Company

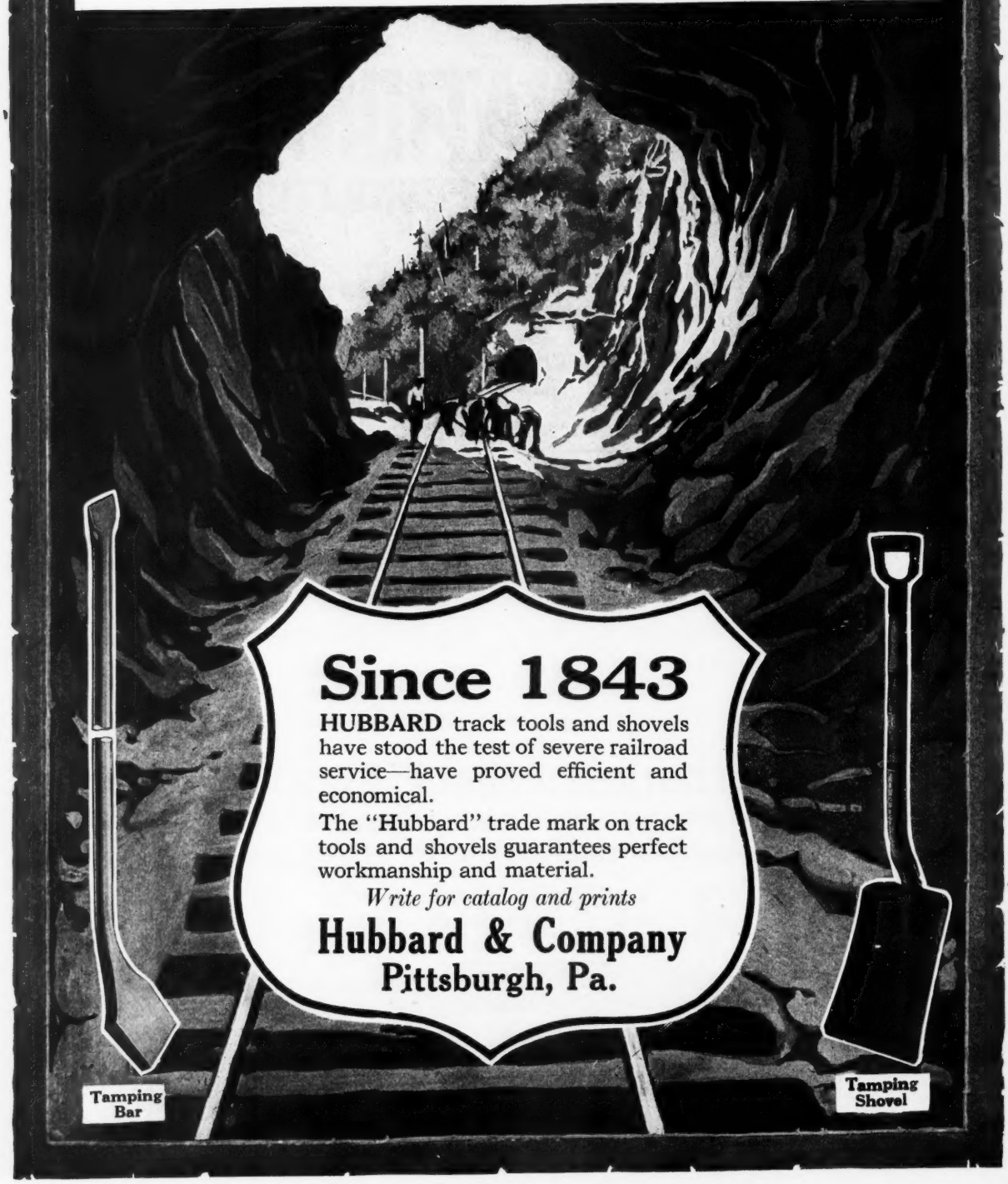
Manufacturers of Steel Twin Ties and Crossing Foundations
General Sales Office and Works: Cleveland, Ohio

REPRESENTATIVES

Western Eng'g Sales Co., Los Angeles, Cal. San Francisco, Cal. Seattle, Wash.
R. J. Cooper Co., Salt Lake City, Utah
J. E. Lewis & Co. Dallas, Texas.
Maurice Joy, Philadelphia.
William H. Ziegler, Minneapolis, Minn.



HUBBARD
Track Tools and Shovels



Since 1843

HUBBARD track tools and shovels have stood the test of severe railroad service—have proved efficient and economical.

The "Hubbard" trade mark on track tools and shovels guarantees perfect workmanship and material.

Write for catalog and prints

Hubbard & Company
Pittsburgh, Pa.

Reading Reversible Rail Benders

A Right and Left Hand Bender Combined

Reading Reversible Rail Bender. Size A for bending all sections of T-rail up to and including 100 lbs.

Saves Time—Saves Labor—Saves Money

CONCEDED by railway men to be one of the greatest labor saving tools on the market.

Two benders combined, a right and left hand bender in one.

Bends within ten inches of the end, either right or left, without applying splice bars or another section of rail.

Can be used also to make your own guard rails or to repair your frogs.

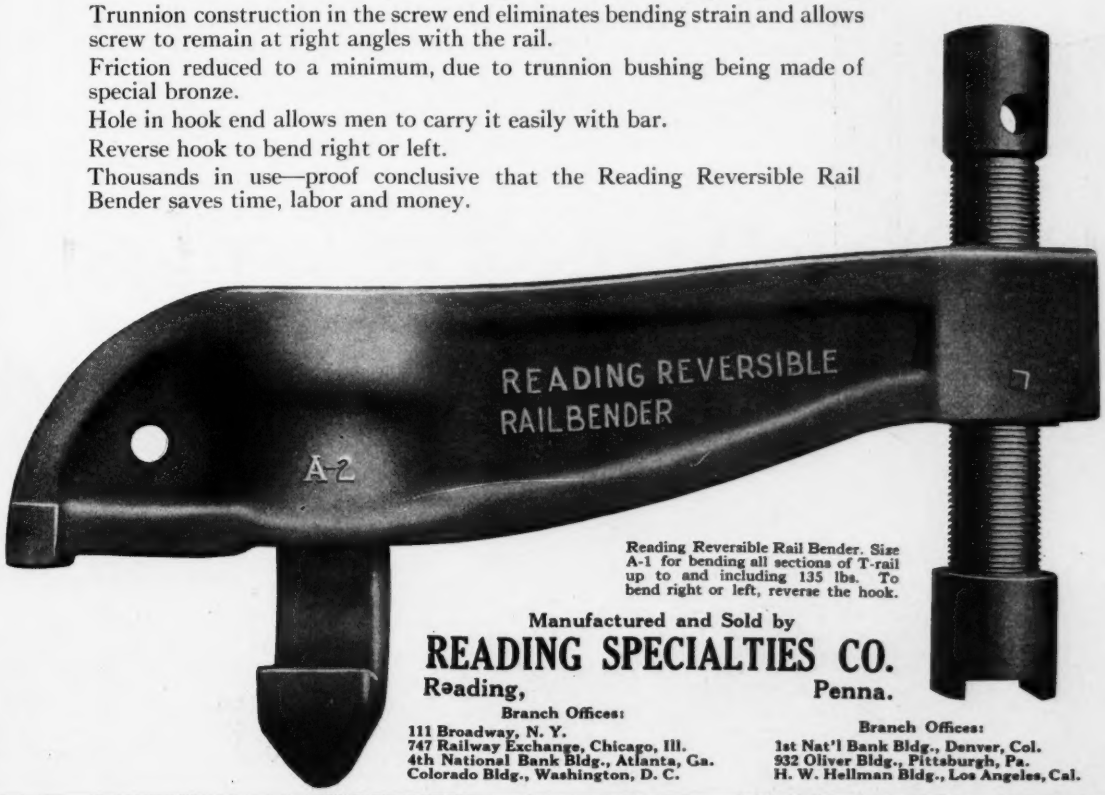
Trunnion construction in the screw end eliminates bending strain and allows screw to remain at right angles with the rail.

Friction reduced to a minimum, due to trunnion bushing being made of special bronze.

Hole in hook end allows men to carry it easily with bar.

Reverse hook to bend right or left.

Thousands in use—proof conclusive that the Reading Reversible Rail Bender saves time, labor and money.



Reading Reversible Rail Bender. Size A-1 for bending all sections of T-rail up to and including 135 lbs. To bend right or left, reverse the hook.

Manufactured and Sold by

READING SPECIALTIES CO.

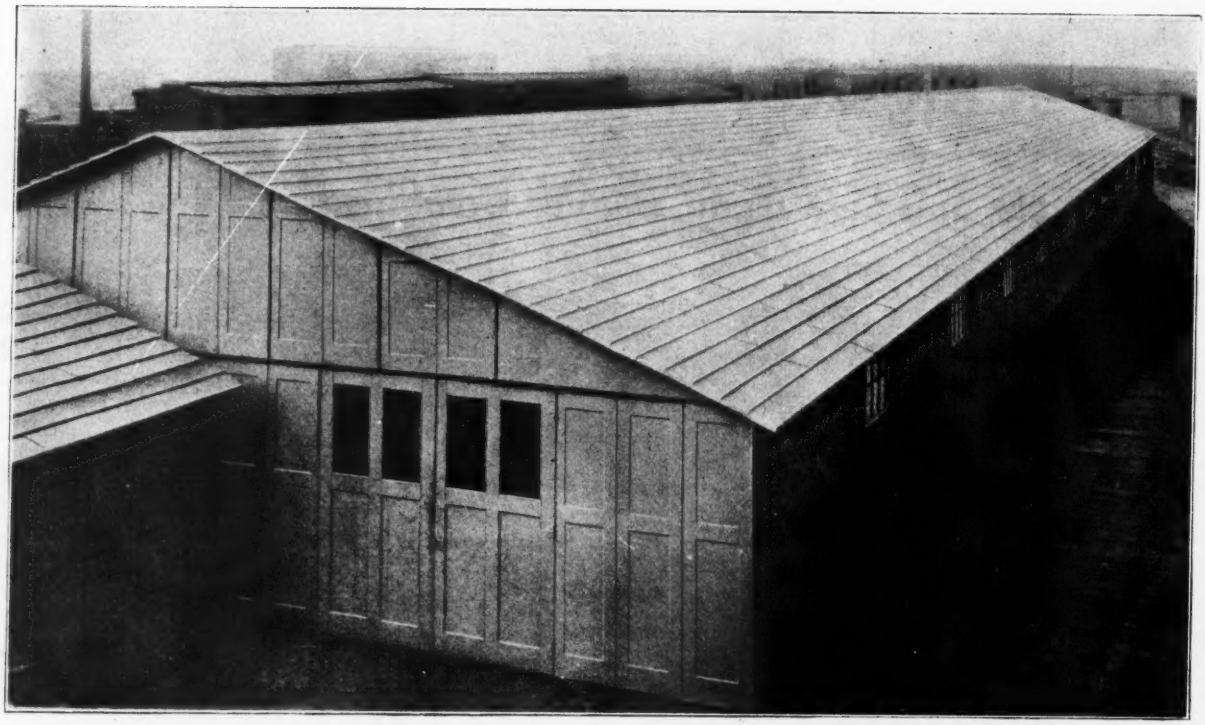
Reading, Penna.

Branch Offices:

111 Broadway, N. Y.
747 Railway Exchange, Chicago, Ill.
4th National Bank Bldg., Atlanta, Ga.
Colorado Bldg., Washington, D. C.

Branch Offices:

1st Nat'l Bank Bldg., Denver, Col.
932 Oliver Bldg., Pittsburgh, Pa.
H. W. Hellman Bldg., Los Angeles, Cal.



The Ever-Ready

Truscon STEEL BUILDINGS

PORTABLE PERMANENT

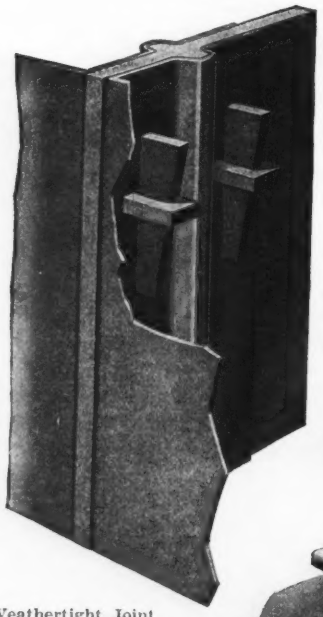
"Preparedness" might well be the slogan of the Truscon Steel Buildings. In railroad maintenance work it is a time-saving aid to know that every operation short of actual erection in the field has been anticipated and performed by the makers. Structural members are ready for instant use.

Simplicity and thoroughness mark assembling methods. The sectional unit panels are interchangeable; any desired plan of wall, windows and doors and any requirement as to size may be met.

One form of slotted bolt and wedge makes all connections; a hammer is the only tool required.

Its purpose served, the Truscon Steel Building can be taken down easily and re-erected without loss of strength or appearance.

The Truscon Steel Building meets thoroughly and satisfactorily the most urgent need of buildings in railroad work. Send for our book on Railroad Structures.



Weathertight Joint between Panels and Mullion.

KAHN Building Products

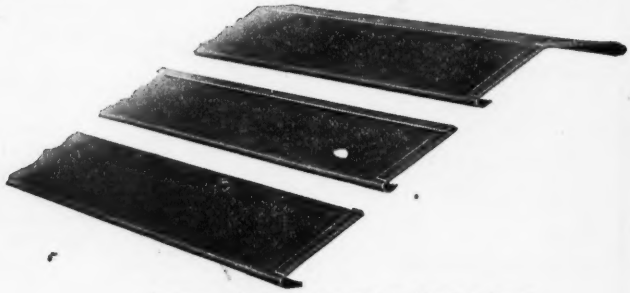
Trussed Concrete Steel Company

KAHN Building Products

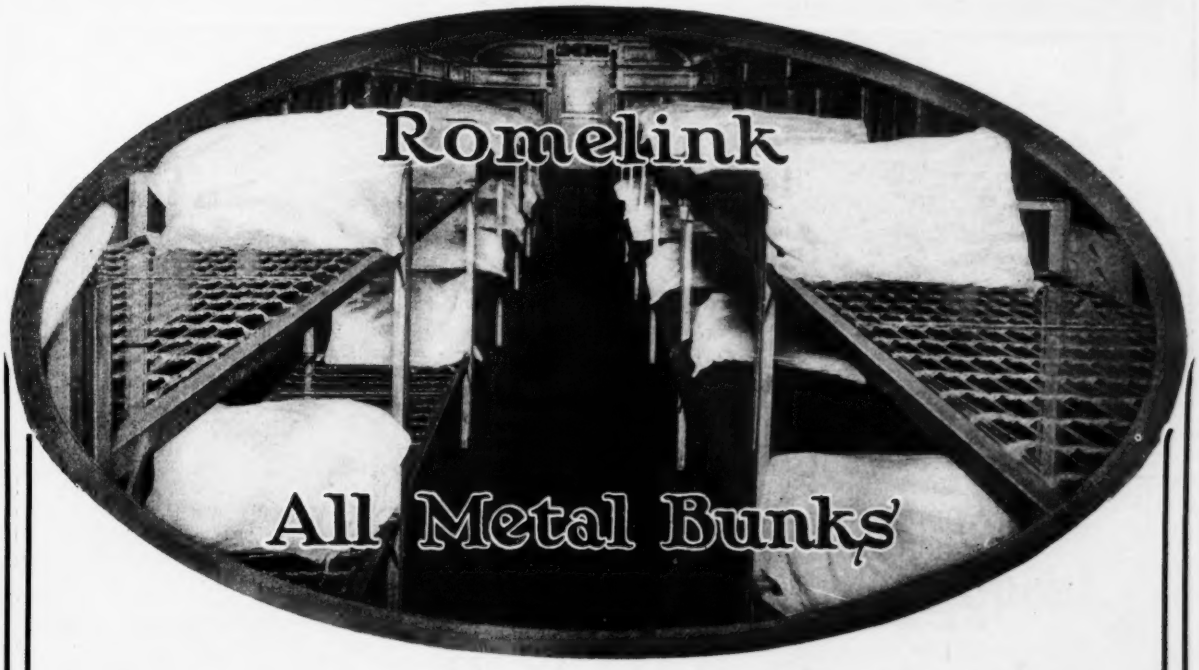
Representatives in Principal Cities

Railroad Department Youngstown, Ohio

Weathertight Joint at Eaves.



Truscon Steel Roofing Plates Showing Eave, Intermediate and Ridge Plates.



A Good Night's Sleep—A Good Day's Work

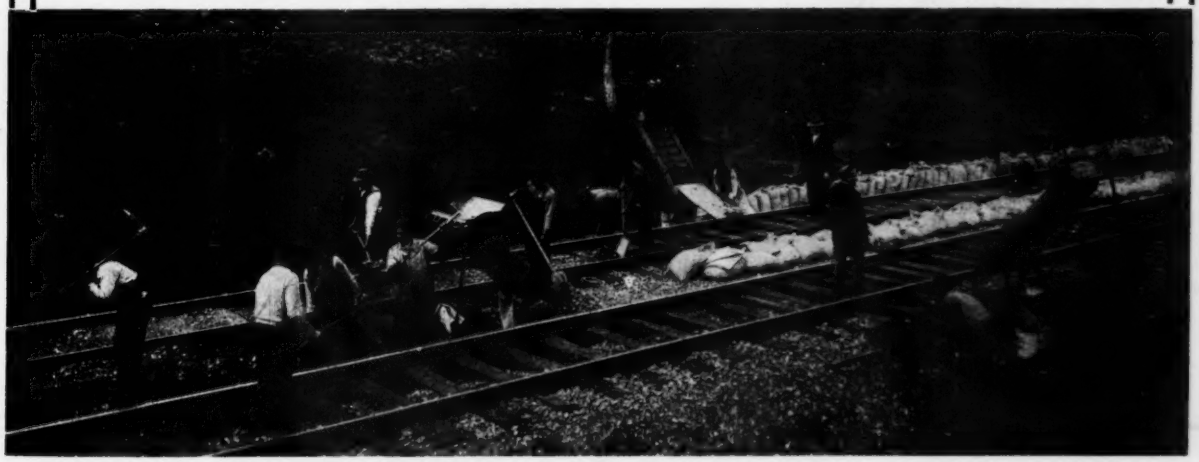
YOU know how ***you*** feel in the morning when you "turn in" a little earlier than usual the night before—you simply "eat up" the work. Well, it works out much the same with your track gangs. Give them clean, restful beds and healthful sleeping quarters and note the amazing difference in efficiency. Well rested men go to the day's work with vim and snap and a contented outlook.

Many big, progressive railroads realize the importance of this factor in the labor problem, especially in these days when help is so scarce. These roads conserve the health and efficiency of their track and construction gangs, by equipping their work cars and camps with Romelink All Metal Work Bunks. Clean, comfortable, vermin and dirt proof, durable and good-looking, these bunks give an atmosphere of wholesome well-being to the sleeping quarters which proves a big factor in keeping men "on the job"—contented and efficient.

We'll gladly send you blue prints and estimates. No obligation whatever.

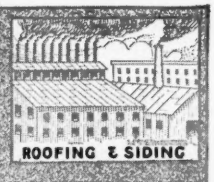
Southern Rome Company

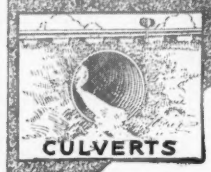
633 West Pratt St., Baltimore, Md.



KEYSTONE

COPPER STEEL





Keystone is the Successful Contradiction to Unsatisfactory Service

Copper-steel sheets last longer under actual weather conditions—a fact proved beyond dispute to well informed buyers and users of sheet metal products.

APOLLO-KEYSTONE Galvanized gives unexcelled service and rust-resistance for Culverts, Tanks, Flumes, Roofing, Siding, Spouting and exposed sheet metal work. Send for latest Keystone booklets.

American Sheet and Tin Plate Company

General Offices: Frick Building, Pittsburgh, Pa.

DISTRICT SALES OFFICES:

Chicago Cincinnati Denver Detroit New Orleans New York Philadelphia Pittsburgh St. Louis

Export Representatives: UNITED STATES STEEL PRODUCTS COMPANY, New York City

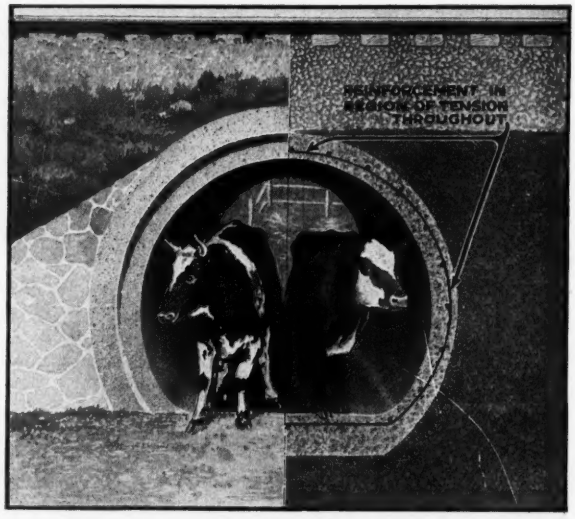
Pacific Coast Representatives: UNITED STATES STEEL PRODUCTS COMPANY, San Francisco, Los Angeles, Portland, Seattle

Massey Concrete Cattle Pass

Here's a point of superiority you engineers will recognize—only in the Massey cattle pass is the reinforcing placed in the region of tension throughout. The cross-section illustrates this big advantage. The strength it adds should be considered when you are contemplating the installation of cattle passes.

The Massey cattle pass is made up at our factories in units 6' long, 84" wide by 72" high inside. Two head of cattle pass through side by side. A flat bottom gives them broader footing.

The Massey pass is built to carry the dead load in deep fills, and live loads when placed within about 3' of the base of the rail. It is more economical than any other type of structure, and requires absolutely no maintenance.



Massey factories make concrete culvert pipe, 12" to 84" in diameter, concrete bridge slabs, piles, and portable concrete houses. Our plant locations and large stock of standard products enable us to make prompt deliveries at low freight rates.

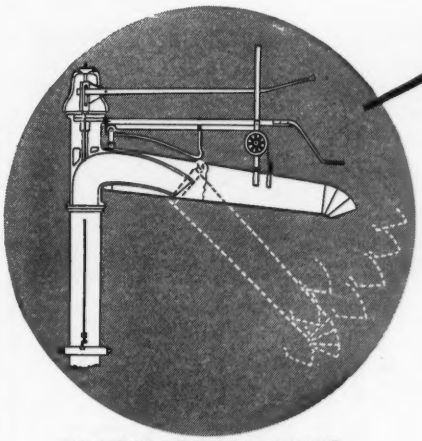
Get Massey Service with Your Cattle Pass

C. F. MASSEY COMPANY

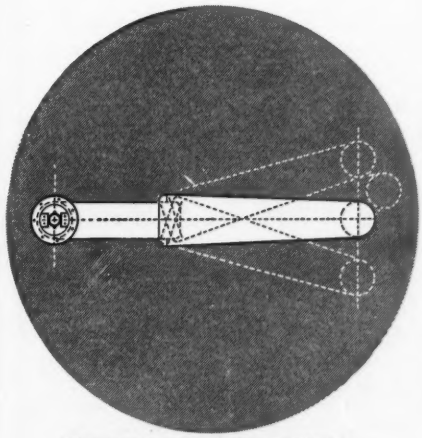
NEW YORK NORFOLK KANSAS CITY Peoples Gas Building CHICAGO MINNEAPOLIS SPOKANE DALLAS

Factories Located at

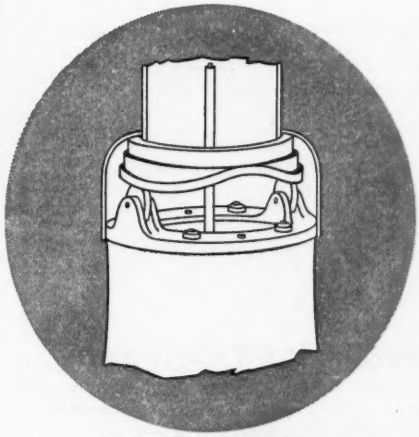
Newark, N. J. Chicago, Ill. Memphis, Tenn. Anna, Ill. Youngstown, Ohio Los Angeles, Cal. Kansas City, Mo. Meridian, Miss. Minneapolis, Minn. Spokane, Wash. Dallas, Tex. Chatham, Ont., Can.



SHOWING VERTICAL RANGE
FENNER DROP SPOUT



SHOWING LATERAL RANGE
FENNER DROP SPOUT



GRAVITY TURNING &
LOCKING DEVICE

Its Quicker-Easier-Safer

to fill your tender tanks with

POAGE *Style* "H" WATER COLUMN

Equipped with

Fenner Drop Spout

Quicker and Easier because the spout can be instantly brought into play without accurately spotting the tender. It works equally well with tenders of different heights. The spout has a vertical range of five feet and a lateral range of three.

The spout is non-freezable. Heavy icicles will not gather upon it. There is no packing at the open telescopic joint, yet, it does not leak a drop of water.

Safer—as soon as it is released the spout swings by gravity to a position parallel with the track and remains there locked. There are no unsafe locking devices to be operated.

The three foot lateral range of the spout prevents the column being tipped over if the tender shifts unexpectedly.

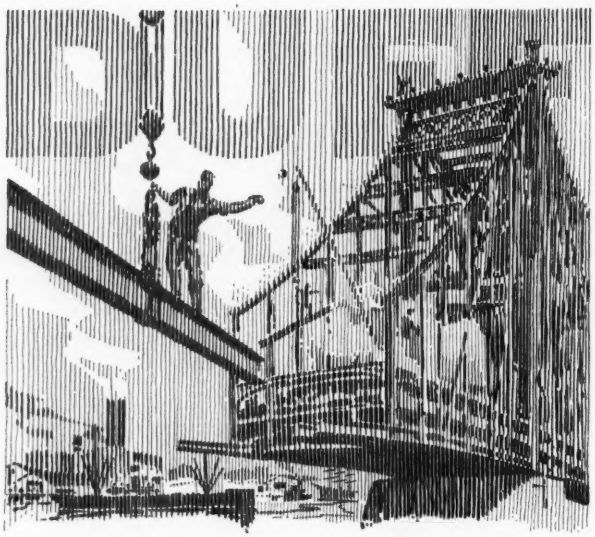
There is no danger of water hammer bursting the mains. The Poage Style H valve shuts off 85 per cent of the flow very quickly and the remaining 15 per cent more slowly—the correct principle to secure quick closure without water hammer.

Try the Poage Style H Water Column—It's better.

MANUFACTURED EXCLUSIVELY BY

The **AMERICAN VALVE & METER COMPANY**

CINCINNATI, O.



Reduce The Hazards Of Bridge Building

The fact that Lifting Jacks play a big part in bridge building and that much depends upon them makes it imperative that they be not only powerful, quick acting and easy to operate and repair, but also safe. Poorly constructed Jacks loaded to capacity may break under the strain and be the means of a costly calamity.

DUFF-BETHLEHEM FORGED STEEL HYDRAULIC JACKS

for years have been recognized as the safest and most efficient Hydraulic Jacks ever produced. The name and reputation of the world's largest manufacturers of Lifting Jacks stand back of them.

They are 30 per cent. to 60 per cent. lighter than any other make of Hydraulic Jack of similar stroke and capacity. All inside parts are forgings, other parts are of bronze. Only eleven interior parts are used. Complete illustrated catalogue will be sent upon request.

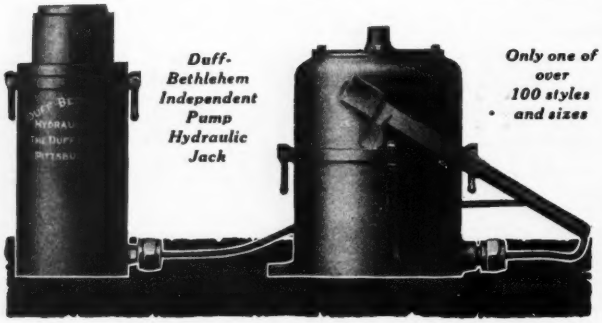
Makers of

Duff GENUINE BARRETT Track Jacks
Duff GENUINE BARRETT Car Jacks
Duff Ball Bearing Screw Jacks
Duff High Speed Ball Bearing Screw Jacks
Duff Bethlehem Hydraulic Jacks
Duff Journal Box Jacks

The Duff Mfg. Co.

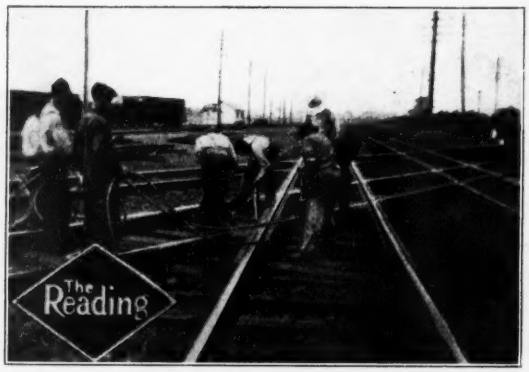
Established 1883 PITTSBURGH, PA.

New York Chicago Atlanta
St. Paul San Francisco



Duff-Bethlehem Independent Pump Hydraulic Jack

Only one of over 100 styles and sizes



"IMPERIAL" TAMPERS

At work on the Philadelphia and Reading tamping the Lehigh Valley cross-over at Port Reading Junction. (The Lehigh Valley also tamps its track with Imperial Tampers.)

This is an ideal spot to demonstrate that Imperial tamped track stands up under heavy traffic far better than the most thorough hand work.

Then too it shows "Imperial" Tampers compacting crushed stone ballast where picks and bars are useless.

ABOVE ALL "IMPERIAL" TAMPERS SAVE LABOR. Work progress faster with fewer men.

Compared with "Imperial" tamping hand work is so uneconomical that it will soon be a thing of the past.

HAVE YOU ORDERED YOUR "IMPERIAL" TAMPING EQUIPMENT FOR NEXT SPRING?

Bulletin 9023.

Ingersoll-Rand Company

11 Broadway New York **165 Q. Victoria St. London**

OFFICES THE WORLD OVER

Air Compressors **Pneumatic Tools**

73-TT

STATEMENT of the ownership, management, etc., required by the Act of Congress of August 24, 1912, of the *Railway Maintenance Engineer*, published monthly at Chicago, Ill., for October 1, 1917.

State of New York }
County of New York } ss.

Before me, a notary public in and for the State and County aforesaid, personally appeared Edward A. Simmons, who having been duly sworn according to law, deposes and says that he is the President of the *Railway Maintenance Engineer*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, Simmons-Boardman Publishing Co., Woolworth Building, New York, N. Y.
Editor, Elmer T. Howson, Transportation Building, Chicago, Ill.
Managing Editor, W. S. Lacher.
Business Managers, none.

2. That the owners are:
Owner — Simmons-Boardman Publishing Co., Woolworth Building, New York, N. Y. Stockholders holding 1 per cent or more of total amount of stock: Edward A. Simmons, Woolworth Building, New York; Lucius B. Sherman, Transportation Building, Chicago, Ill.; Henry Lee, Woolworth Building, New York; Henry Lee, Woolworth Building, New York (Trustee for Thos. Prosser); Samuel O. Dunn, Transportation Building, Chicago, Ill.; Roy V. Wright, Woolworth Building, New York; Elmer T. Howson, Transportation Building, Chicago, Ill.; H. H. Simmons, Transportation Building, Chicago, Ill.; Ida R. Simmons, 1625 Ditmas Ave., Brooklyn, N. Y.; Bradford Boardman, 203 W. 40th St., New York; Francis Boardman, Riverdale, N. Y.; A. C. Boardman, Riverdale, N. Y.; F. H. Thompson, Transportation Bldg., Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: Clara Boardman Peck, 776 Lexington Ave., New York, N. Y., and Henrietta F. H. Boardman, 103 East 86th St., New York, N. Y.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

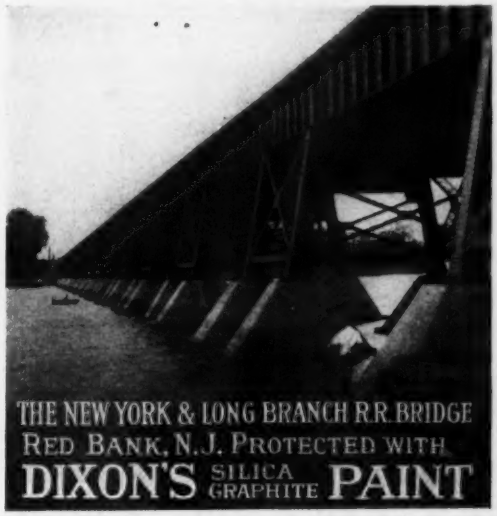
EDWARD A. SIMMONS.

[SEAL]

Sworn to and subscribed before me this 1st day of October, 1917.

G. H. RAYMOND.

Notary Public, Kings County, No. 50; Certificate filed New York County No. 102; New York Register No. 8113; Commission expires March 30, 1918.



Naked steel, like the naked human, is at the mercy of the elements. The better the covering the better the protection.

As a protective covering for all metal and for wood

DIXON'S
SILICA GRAPHITE PAINT

has a world-wide reputation of over fifty years. It gives greatest protection and greatest economy. Adopted by many of the leading railroads of the country, after exhaustive tests, for construction and maintenance work because it costs the least per year of service. Made in First Quality Only.

We can prove it if you will write for Booklet No. 187-B.

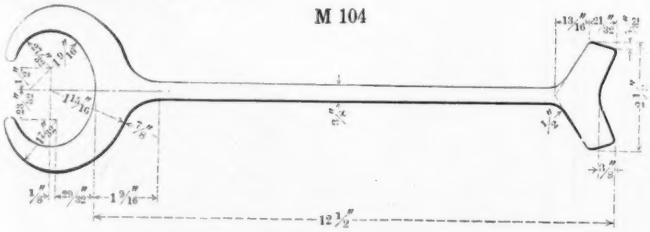
Made in JERSEY CITY, N. J., by the

Joseph Dixon Crucible Company

Established 1827

Steel for Service

M 104



When contractors estimate on excavation jobs, the natural tendency is to take too great chances.

Sometimes a competitor takes a job because he does not include sheet piling in his bid and may complete the work without any need of it. That the risk is often too great, is proven by disastrous cave-ins.

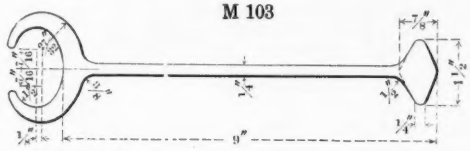
If, however, a man includes an item of sheet piling in his bid, that in some cases would prohibit him from taking the work if the total cost were applied against that one job.

If, on the other hand, he should purchase it as a part of his permanent equipment and so distribute the cost over several jobs, that would allow him to include it in this particular job, and, at the same time, run no risk, while his competitor with no sheet piling included, stands a chance to lose money.

United States Sheet Steel Piling

is usually a profitable investment for any contractor engaged in excavation work.

M 103



Carnegie Steel Company

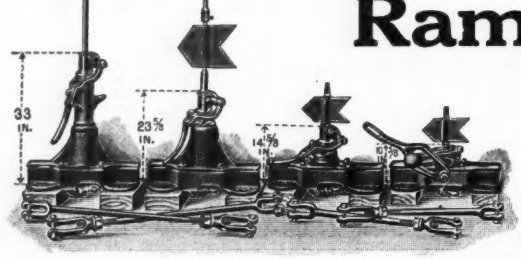
General Offices—Pittsburgh, Pa.

891

RAMAPO

Automatic Safety Switch Stands are Manufactured only by the

Ramapo Iron Works



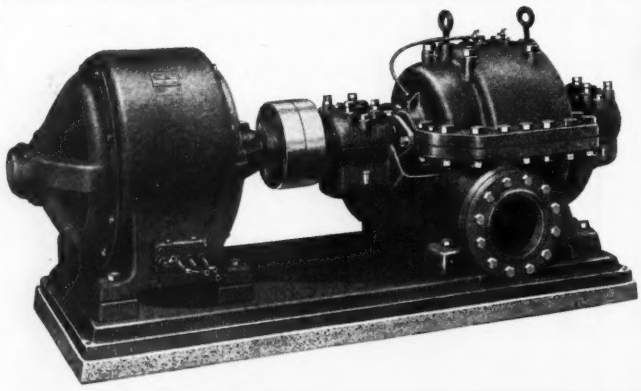
Write for Descriptive Catalogues on

Switch Stands, Switches, Frogs, Guard Rail Clamps, Etc.

Manganese Track Work a Specialty.

Ramapo Iron Works Main Office: HILLBURN, N. Y.

WORKS: Hillburn, N. Y., and Niagara Falls, N. Y.



GOULDS PUMPS

FOR EVERY SERVICE

Centrifugal, Triplex, Deep Well, Diaphragm, Rotary, Vacuum, Portable, Sinking and many other types in hundreds of styles and sizes for all standard and special services.

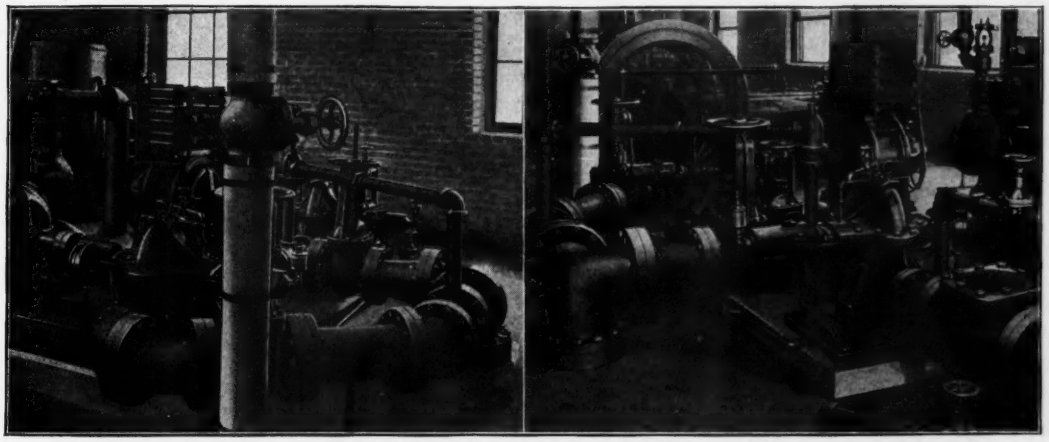
If you use pumps let us send you a complete set of Goulds Bulletins for your reference files.

THE GOULDS MANUFACTURING COMPANY

Main Office and Works: SENECA FALLS, N. Y.

Branch Houses: Boston New York Philadelphia Chicago
District Offices: Pittsburgh Atlanta Baltimore Houston

AMERICAN



Combining Flexibility with Economy in Modernizing a Pumping Plant

How a modern pumping plant not only maintains high efficiency, but is adapted for the widest range of service.

The City of Rochelle, Ill., own and operate their light, power and waterworks plant. Recently they decided to replace duplex double-acting steam pumps, for supplying the city with water from surface reservoir into distributing system and elevated tank, with more modern pumps.

The new installation consists of two "American" 4-inch, type DSMD, horizontally split volute, single-stage centrifugal pumps direct connected through flexible shaft couplings to 35 h.p., 3-phase, 60-cycle, 220-volt General Electric slip ring motors, designed to operate at 1750 r. p. m.

Each pump was designed to have a capacity of 500 g. p. m. when operating under a total head of 140 feet and has a mechanical efficiency of 68 per cent.

These pumps are fitted with pipe connections which permit them to be operated singly or in parallel for domestic service or in series for fire pressure.

The accompanying illustrations show two views of this installation. Note that while an installation of greatest flexibility is provided, the entire equipment occupies very small space; also that the efficiency is high for pumps of so small a size.

The ability to combine great economy of operation with greatest flexibility of service is rapidly popularizing this type of pumping installation with discriminating users.

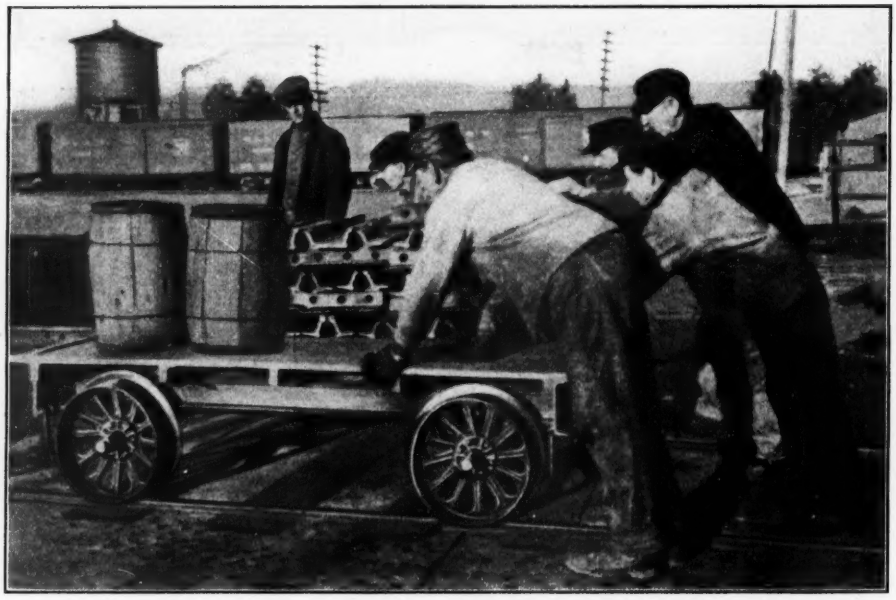
Catalog 149 describes these pumps. Write for it.

The American Well Works

General Office and Works: Aurora, Ill., U. S. A.
Chicago Office: First National Bank Bldg.

District Sales Agencies:

New York City (Domestic and Export)
Philadelphia, Pa.
Pittsburgh, Pa.
St. Paul, Minn.
San Francisco, Cal.
Los Angeles, Cal.
Lincoln, Nebr.
Birmingham, Ala.
Artesia, New Mexico
Dallas, Texas
Montreal, Canada
Chatham, Ont., Can.
Edmonton, Alta.
Salt Lake City, Utah
Denver, Colo.
Kansas City, Mo.
Joplin, Mo.
St. Louis, Mo.
Calgary, Alta.



The passing of Finnegan's gang

THE hour was early and the haze gave promise of a hot August day. Pat Finnegan, Foreman of Section 23, with his usual Celtic vigor, had hustled his men. His push car was loaded, ready for the start.

Now, Finnegan's car was in bad order, and as a result, Pat was in bad humor. But the work had to be done and away they went with five huskies pushing.

The push car ran hard; the sweat poured; and the bearings squeaked and groaned. But that was no fault of Pat's any more than it was his fault that his hand car was also laid up with bearing trouble.

Finnegan was a careful man. He always kept his sleeves rolled up and his sleeve bearings well greased—but, "what's the odds?" thought Pat, as he and his comrades spat on their hands and started the heavy push car.

* * * *

Garfield, the new roadmaster, rose to leave. "Hold on a moment," said the Division Superintendent, "remember all I've told you. Maintenance costs have got to come down and it's your job to get them down, that's why you have been appointed. Good-day, Garfield. Good-luck to you."

* * * *

Down at the junction stood Garfield, the Road Master, the Superintendent's remarks fresh in his mind. Finnegan's gang toiled up the grade. Garfield saw them. "Who is that Section Boss?" he asked. "Him, that's

HYATT BEARINGS

Finnegan," said a Brakeman. "Thank you," said the Road Master as the gang passed by. Finnegan looked up surprised, then the car moved out of sight around the curve. But that idea brought to the Road Master's mind by the passing of Finnegan's gang did not disappear, but resulted in the saving of many thousands of dollars annually.

Perhaps you have a Finnegan on your road, it is certain you have the same chance for big savings. Watch these advertisements and see how the Passing of Finnegan's Gang led to the solving of a perplexing problem and the saving of a considerable sum annually. Keep your eye on Finnegan's Gang.

Hyatt Roller Bearing Company

NEWARK, NEW JERSEY

Makers of bearings for roller tables, all kinds of cars and trucks, cranes, trolleys, hoists, line shafts, countershafts and machine tools, concrete mixers, etc.

1114

Replacement box equipped with Hyatt Roller Bearing ready for installation on motor car.

LIST OF MANUFACTURERS AND BOXES THEY CAN FURNISH YOU

Fairbanks-Morse Co.....Chicago, Ill.
Boxes for their hand and push cars

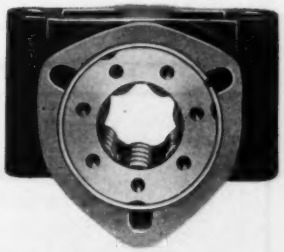
Kalamazoo Ry. Supply Co.....Kalamazoo, Mich.
Boxes for their hand or push cars

The Buda Company.....Chicago, Ill.
Boxes for their hand and push cars

Mudge & Company.....Chicago, Ill.
Boxes for their motor cars

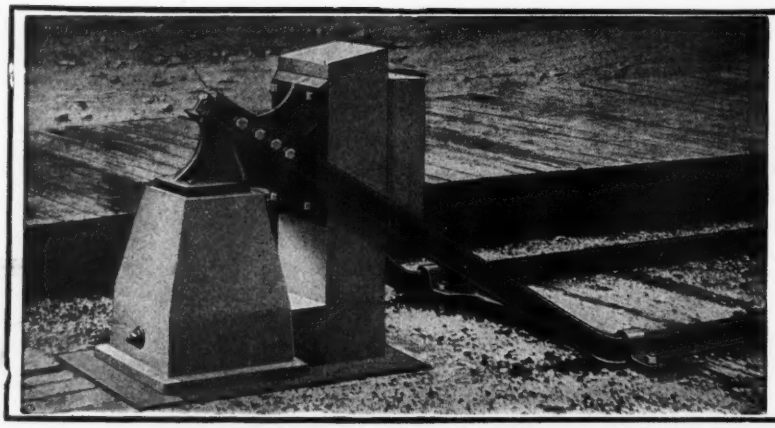
Fairmont Gas Eng. and Ry. Motor Car Co.....Fairmont, Minn.
Boxes for all Fairmont cars—and all other makes of hand and push cars

Northwestern Motor Co.....Eau Claire, Wis.
Boxes for extra gang cars only



Replacement box equipped with Hyatt Roller Bearing ready for installation on push or pump car.

FOR SERVICE CARS



ELLIS

PATENT

Bumping Post

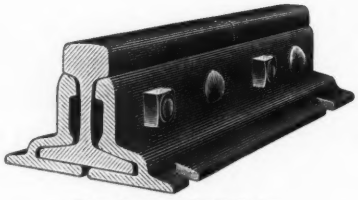
Simple, Strong and Lasting
Adapted to All Positions

Mechanical Manufacturing Co.
Chicago, Ill.

The Rail Joint Co.

GENERAL OFFICES:

61 Broadway **New York City**



Continuous Rail Joint

Makers of Continuous, Weber, Wolhaupter and 100% rail joints.

Standard—Insulated—Step—Frog and Switch Types.

Grand Prize San Francisco 1915

Protected by Patents

Low Maintenance Cost

easy installation and longer service *dictate* the use of

STEWART IRON FENCE
"The Standard of the World"

for all work at stations or within switching limits for intertrack fence, right-of-way fence and concourse enclosures.

Stewart fence and gates are built to meet your particular problem in handling crowds, protecting property and preventing damage suits.

Scientifically designed. Last a lifetime.

Experience records of leading roads prove Stewart fence the cheapest and best protection in the long run. Write for catalog. State your problem and get the facts.

Iron and wire window guards, wire partitions for baggage rooms, store houses and tool rooms.

THE STEWART IRON WORKS COMPANY, Inc.
700 Stewart Block **Cincinnati, Ohio**
"The World's Greatest Iron Fence Builders"

ROBERT W. HUNT JNO. J. CONE JAS. C. HALLSTED D. W. McNAUGHER

"Hunt Inspection"

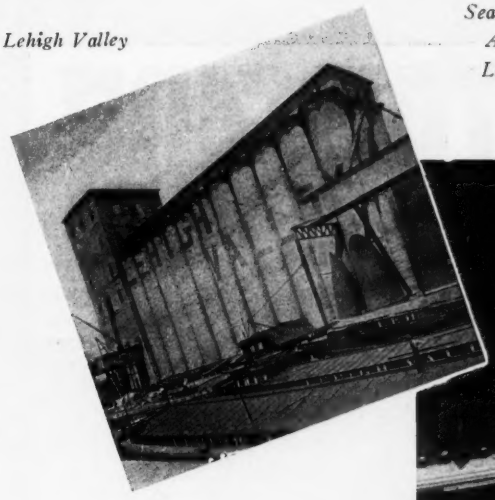
Will help Railroads operate with greater safety and less expense.
Structural and Reinforcing Steel and Machinery,
Cement and Creosoted Block for Bridges, Buildings and Other Structures
Inspected and tested at Point of Manufacture. Chemical, Physical, Cement Laboratories.

ROBERT W. HUNT & CO., ENGINEERS

GENERAL OFFICES CHICAGO

NEW YORK PITTSBURGH ST. LOUIS SAN FRANCISCO SEATTLE DALLAS KANSAS CITY MONTREAL

Lehigh Valley



Seaboard Air Line

New York Central

A. C. & S. R.R.

Gunite on the Railways

Gunite on the railways is an interesting story. The variety and constantly increasing uses for this sand-cement product of the

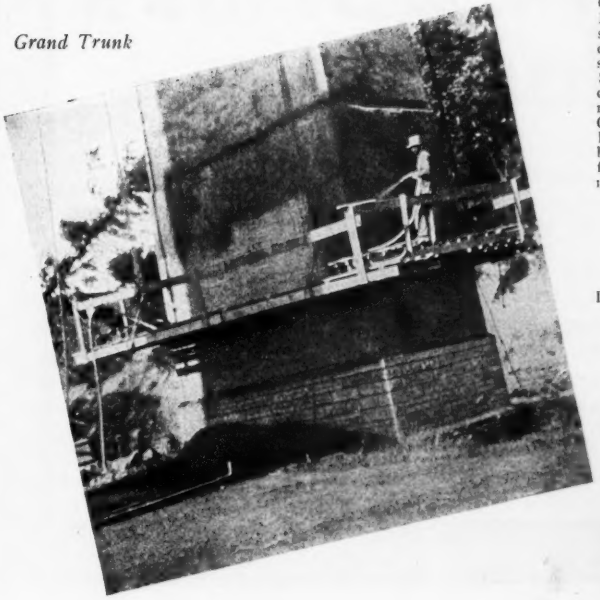
CEMENT-GUN

on the "arteries of our Nation," combined with the constant saving of time and money in the saving of old structures and the building of new ones, has but proved the truth of the fact that

A Cement-Gun for Every Division

Means Saving in Time and Money the Whole Line Through

Grand Trunk



We have told you how and why the Lehigh Grain Elevator withstood the great "Black Tom Explosion." How the N. Y. C. & H. R. R.R. uses Gunite for sealing rock cut. Of its use at the Grand Central Station, New York. Told you how the Grand Trunk, by means of the Cement-Gun, saved an old bridge. How the "Seaboard" secured speed, permanency and economy in the construction of their shops. Told how the A. C. & S. Ry. solved a bridge problem at Atlantic City.

Soon we will give you interesting data on station and section house construction work on the N. C. & St. L. Ry. Watch for it and in the meantime write for data on the safety and saving secured by the use of Gunite on the Railways.

From Europe comes news of the destructive work accomplished by the big guns in the great struggle. From the American Railways come the facts of the constructive work of Cement-Guns in the great struggle to make our Nation's arteries more efficient.

Cement-Gun Co., Inc.

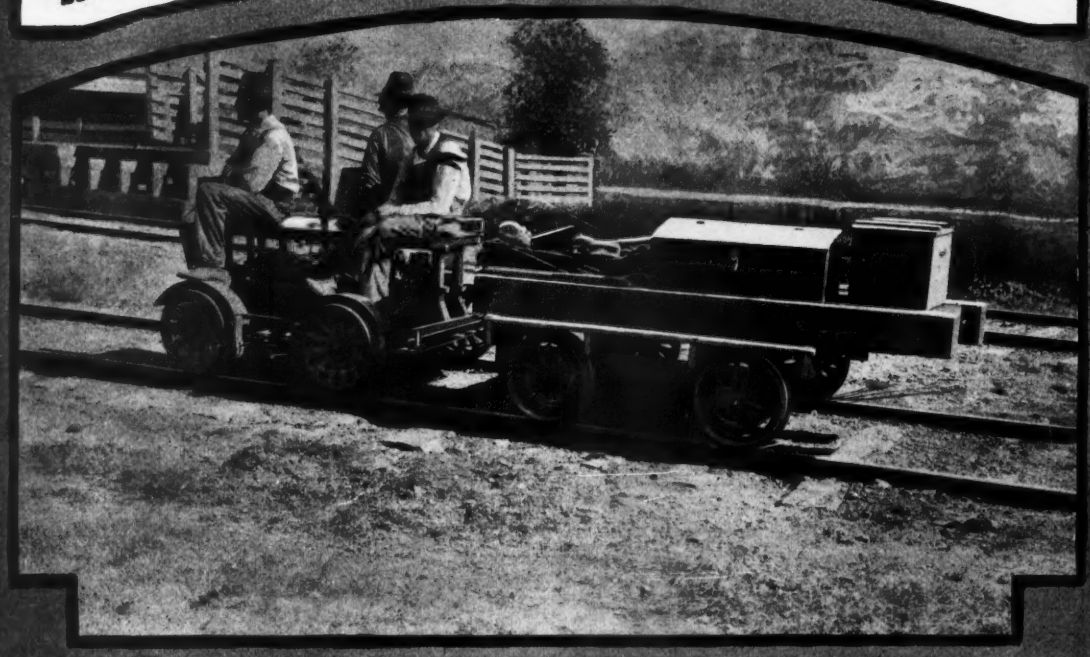
ALLENTOWN, PA.

New York Office, 30 Church Street

E. R. Ayers, 1414 Fisher Bldg., Chicago, Ill.; John A. Traylor, Newhouse Bldg., Salt Lake City, Utah; Taylor Engineering Co., 538 Central Bldg., Seattle, Wash.; Taylor Engineering Co., Vancouver, B. C.

Western Maryland Railway

MUDGE MOTOR CARS



This Load At 20 Miles An Hour

Results obtained out on the line—hurry calls for men and supplies—these situations give convincing proof of the **power** and **endurance** behind **Mudge Motor Cars.**

Any workman in your employ can successfully operate a Mudge Motor Car, so simple is its construction.

You won't have to go far to find a Mudge Motor Car—look up the one nearest you and get the facts first hand.

Mudge Cars are made in nine models, to meet all your requirements. To what address shall we send you a complete set of specifications?

Mudge & Company

Railway Exchange Chicago, Ill.

Railway Maintenance Engineer

Volume 13 November, 1917 Number 11

(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age Gazette* and *Railway Engineering and Maintenance of Way.*)

Published on the last Thursday preceding the date of issue by the
SIMMONS-BOARDMAN PUBLISHING CO.,
TRANSPORTATION BUILDING, CHICAGO, ILL.

NEW YORK: WOOLWORTH BLDG. CLEVELAND: CITIZENS' BLDG.
WASHINGTON: HOME LIFE BUILDING.
LONDON: QUEEN ANNE'S CHAMBERS, WESTMINSTER.

EDWARD A. SIMMONS, *President.* LUCIUS B. SHERMAN, *Vice-President.*
HENRY LEE, *Vice-President and Treas.* M. H. WIUM, *Secretary.*
ELMER T. HOWSON, *Editor.*
WALTER S. LACHER, *Managing Editor.* JOHN G. LITTLE, *Associate Editor.*

Entered at the Post Office at Chicago, Ill., as mail matter of the second class.

Subscription price, including the twelve regular monthly issues of the *Railway Maintenance Engineer* and the four daily issues of the *Railway Age Gazette*, published in connection with the annual convention of the American Railway Engineering Association: United States, Canada and Mexico, $1.00; foreign countries (excepting daily editions), $2.00.

WE GUARANTEE that of this issue 8,100 copies were printed; that of these 8,100 copies, 7,468 were mailed to regular paid subscribers, 122 were mailed to advertisers, 71 were mailed to exchanges and correspondents, and 439 were provided for new subscriptions, samples, copies lost in the mail and office use, that the total copies printed this year to date were 88,360, an average of 8,033 copies a month.

The *Railway Maintenance Engineer* is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

CONTENTS

EDITORIALS 341
LETTERS TO THE EDITOR 343
THE TRACK LABORER AND LIQUOR LEGISLATION 344
THE BONUS SYSTEM FOR MAINTENANCE WORK; W. C. NISBET 347
THE PENNSYLVANIA TRACK INSPECTION 349
"SMOKES" FOR RAILWAY TROOPS 349
TRACK CONSTRUCTION AT THE CANTONMENTS:
- TRACK CONSTRUCTION AT CAMP GRANT; C. J. MCCARTY 350
- BUILDING THE TRACKS AT CAMP UPTON; COLEMAN KING 353
- TRACK WORK AT CAMP PIKE AT LITTLE ROCK, ARK. 354

SAFETY FOR MAINTENANCE OF WAY MEN:
- LIABILITY OF NEW MEN TO ACCIDENTS; T. H. CARROW 355
- HANDLING MATERIALS; J. T. BRODERICK 355
- OPERATION OF HAND AND MOTOR CARS; S. G. WATKINS 357

THE BRIDGE AND BUILDING CONVENTION:
- OPENING BUSINESS 358
- COMMITTEE REPORTS AND DISCUSSIONS 359
- CLOSING BUSINESS 370

THE MASTER PAINTERS' CONVENTION 371
THE MATERIAL MARKET 371
GENERAL NEWS 372

Keep the Camps Tidy

Aside from their advantages in holding men, properly constructed, neat and clean labor camps, like any other adequate maintenance, work to the benefit of the railroad through the favorable impression they give the traveling public. Contrarywise, a row of battered, weather-beaten bunk cars, surrounded by rubbish and other evidences of general untidiness, will more than offset the effect of the neatest ballast dressing and the straightest grass line. Why not help the reputation of the road rather than injure it, in the operation of camps? Keep them neat and then announce by suitable signs what they are. Thus the public will be advised that the road is spending money for the upkeep of its property, and the men will profit by the knowledge that the company is not ashamed of them and their quarters.

Watch the Tin-Covered Decks

The protection of pile or frame trestles from fire by means of a sheathing of sheet iron or steel over the deck is a common practice and if the metal covering is maintained in good condition it serves as an efficient means of reducing the fire hazard from flying sparks or falling cinders. However, where the continuity of the coating is interrupted by holes rusted in the sheets or open joints, the sheathing becomes more of a menace than a protection. Sparks coming in contact with the timber by going through the cracks in the sheet iron, start fires which, concealed by the covering, are not discovered until they have gained considerable headway. In consequence fires starting in covered trestles frequently result in the complete loss of the structures. With the current shortage of men and the slow delivery of materials there is naturally a tendency to neglect such matters with a consequent increase in the responsibilities of the master carpenter. The situation calls for increased vigilance and the most efficient repair of the sheathing with the materials at hand.

A Severe Trial for the Foreman

In general, the ability of a foreman is measured by the number of men he is capable of handling with success. A section foreman is considered a favorable candidate for the head of an extra gang if he has been able to handle a large section gang effectively. Under present circumstances the reverse of this criterion is more nearly true, for the man most valuable to the railroad to-day is the one who can produce the best results with a small gang or who can succeed in keeping up his track (for a limited time, at least) with little or no gang at all. No better test of the foreman's metal has ever been found than that unfortunately imposed upon so many men at the present time. It is indeed discouraging to struggle along with only one man on a section of track that requires at least five to insure a condition of standard maintenance. Many instances are brought to notice of foremen who are making the best of the discouraging odds imposed upon them, such as the man who will go out each day alone with a track jack to raise as many joints as he possibly can, notwithstanding his responsibility for the entire section which demands that he go over all of his track

each day. A case is also cited of the foreman who, with only one man, succeeded in making a large part of the tie renewals authorized. Such men deserve the greatest commendation of the railroads which employ them. It is because of them that the tracks hitherto maintained to high standard are standing up so well this season under the heavy traffic with the pitifully small track forces it has been possible to secure on many roads.

PREPARE FOR THE WINTER

THE handicaps under which all branches of the maintenance of way department, and particularly the track forces, have been laboring during the past summer make it more than usually necessary that every effort be concentrated from now on to prepare for the winter. While no one can predict with any degree of certainty the severity of the weather which will be encountered, there is every indication that the record-breaking traffic now being handled will continue at its present high tide and will probably increase because of the large crops to be moved, the demand for coal and other conditions. Every maintenance man is familiar with the shortage of labor and the difficulty in securing material during the season now closing and the effect of these handicaps on the present condition of the track. Few railroads have been able to maintain their properties to the customary standards this year and as a result they are going into the winter in poorer condition than usual. It is, therefore, obviously necessary for every track man to concentrate his attention now on getting the road into such shape that traffic can be handled safely, even though it is probable that the tracks will not ride as well as normally. Even under the most favorable conditions the next few months will constitute a severe tax upon tracks and other facilities and the success with which the traffic will be handled will depend to a great extent on the maintenance of way department.

DEVELOPMENT OF LABOR SAVING DEVICES

THERE has never been a time in which as much interest has been shown in labor-saving devices applicable to the maintenance of way field as the present. The shortage of men is universal and the extremes to which supervisors and foremen have been brought have led to the development of many devices to save labor, the larger number of which are relatively simple and capable of widespread adoption if brought to the attention of other men. We desire to aid in the dissemination of information of this character and we have, therefore, announced a contest in labor-saving kinks. Contributions to this contest are limited to devices applicable to the engineering and maintenance of way field and consist of descriptions either of appliances or of methods which are new or not generally known or of new uses of well-known equipment. The description of devices will be further limited to those, the universal use of which is not restricted by patents. We solicit descriptions of "kinks" applicable to all branches of the maintenance of way department. To stimulate interest in the contest, prizes of $25 and $15 will be paid for the first and second best contributions, respectively, while we will pay our regular space rates for all others accepted and published. The prizes will be awarded for the contributions describing those devices which in the opinion of the judges are of the greatest practical value and of the widest application to maintenance work. All contributions should be sent to the editor of the *Railway Maintenance Engineer*, 608 South Dearborn street, Chicago, and must be received before November 10, in order to be submitted to the judges.

REDUCING THE LABOR TURNOVER

ONE of the fundamental requirements of efficiency in any organization is an experienced force of workmen, for best results cannot be expected from men unfamiliar with or unskilled in their duties. This shows at once the importance of holding men in service as long as possible in order to gain the benefit of their increasing experience. In other words, it is important to reduce the labor turnover to the practical minimum. Because of this the figures regarding the average length of service of track men presented in another column by T. H. Carrow are startling, showing as they do an average turnover of practically the entire track forces each year. In other words, the average length of service of track men is estimated to be only one year at present as compared with twice that period for all railway employees. It is true that many men remain in track work for years, but for every such a man enough others work shorter periods to bring the average down to one year. Regardless of the causes for the men leaving the service (and they are numerous), the fact that they do leave constitutes the greatest drain on efficiency in the maintenance of way department to-day and forms the most severe handicap under which this department is laboring. When, and only when, this tremendous loss and waste are realized will working conditions be improved and methods be adopted which will tend to overcome the constant shifting of forces and the severe handicaps of inexperienced labor. A number of industrial plants have realized the loss of efficiency resulting from a high labor turnover and have been successful in reducing it very materially. However, the improvements which have been made in these plants are small in comparison with those which are possible in the maintenance of way department with its 400,000 employees.

SEARCH FOR SURPLUS MATERIALS

ONE of the most valuable features of the convention of the American Railway Bridge and Building Association was the consideration of the present material situation as it affected the members of that association. The average man out in the field is accustomed to order the materials required for his work and to expect that they will be on the ground when he arrives. When this source of supply is shut off, he is frequently at a loss to know how to proceed.

To the extent that present conditions require the roads to examine the supplies of materials on hand and to use the surplus accumulations of previous years, the present situation constitutes a "blessing in disguise." Supplies costing surprisingly large sums of money are to be found distributed over the lines of almost every large system if the proper search is made for them. The tendency is natural for each employee to provide a reserve supply of repairs sufficient to protect himself against any possible emergency regardless of the practical necessity for this custom. There will never be a more opportune occasion than the present for the roads to reduce this stock to the minimum consistent with practical safety.

There is a further and probably an equally important opportunity for the conservation of materials at present in the reclamation or recovery of materials which may have shown no economy under normal conditions. The instance pointed out by C. R. Knowles in a paper presented before the convention, an abstract of which appears an another page of this issue, in which abandoned water pipe is now being dug up at a handsome profit, although estimates of the cost of this work at normal prices for the pipe showed no economy, can be duplicated many times. More than this. the recovery of materials

of this kind permits the available supply of new materials to be used elsewhere and relieves the shortage.

This problem is not primarily one for the general officers, for those most familiar with materials which can be recovered and reclaimed are the local officers on the divisions and it is to them that the railways must look for most of the savings at this time. The men in the field have an opportunity at present not only to expedite their work by providing themselves with materials, but also to relieve materially the shortage of supplies throughout the country. The extent to which the roads will be able to proceed with many classes of work during the next few months depends very largely upon the extent to which the available materials are reclaimed.

STUDY YOUR PROBLEMS

THE trying times through which we are now passing are bringing about so much that is new and unusual to us that they call for a marked readjustment of ideas in a great many matters. In some ways this is not an unmixed evil. It calls for a real analysis of problems that have been disposed of heretofore entirely by established rules or precedents. The new conditions have changed all this, and, particularly in bridge and building matters, many established rules no longer apply.

No better illustration can be cited than that bearing on the relation between renewals and current maintenance. In general, renewals are made when the cost of maintaining the old structure in a safe and usable condition exceeds the cost of maintaining a new structure, plus the interest on the additional investment. In the case of an unusual structure or in replacement by some new form of construction, it is necessary to test out this principle carefully before proceeding, but with renewals in kind of the usual railway structures, this law has been put into practice so often that the experienced maintenance man knows the answer off-hand. He can tell by the condition of the old structure whether it is cheaper to carry it over another year or to renew it. Of course, a certain amount of variation enters into the application of this principle from year to year, depending on whether or not the road has the ready money for the replacements, but these circumstances do not confuse the experienced man, and in the course of years he accumulates an intimate knowledge along these lines that is commonly termed judgment. However, this knowledge is built up on a relation of costs that, until recently, did not change appreciably from year to year.

This entire fabric is now upset. Prices have run riot and they bear entirely different relations to each other. Timber is now cheaper, relatively, than other materials, while the prices on some other materials are unstable, and it is hard to guess what they will be two months in advance. Thus, where a certain condition of the planks of a platform formerly called for its replacement, without question, to-day it may be advisable to patch it up. A water tank may be in such condition that the expense of keeping it safe against rupture or even excessive leakage is so great that a new tank would surely be authorized if obtainable at usual prices. At present, however, this may not be the case.

High upkeep is usually more a matter of labor than materials, and, since labor will probably be still scarcer in the future than at present, a new structure, even though high in cost, may be the best solution of the labor problem. Dates of delivery, car shortages, priority rulings, these and other questions serve to complicate the problems of the maintenance officer and require that he study the facts in each case with care, bearing in mind that past practice may not necessarily be correct at present.

LETTERS TO THE EDITOR

THE RAILROAD BEAUTIFUL

GASSAWAY, W. VA.

TO THE EDITOR:

What railroad men has not at some time stood at a vantage point and gazed in admiration at a stretch of perfect track? Every true railroad man, from a president down to the humblest laborers, has done it many times—and found pleasure in it. Railroad men are not the only ones that take notice of perfect, well kept track. Almost every person who comes in contact with the railroad notices it. Perhaps few make remarks about the track, but they make mental notes, nevertheless; mental notes that will have a whole lot to do with the way they travel the next time.

A couple of years ago the writer stood on the rear platform of a passenger train in northern Illinois looking back over the fast receding rails. It happened to be an unusually well kept piece of railway, perfectly lined and surfaced and ballasted. A passenger standing by the writer made the remark: "Isn't that a beautiful piece of railroad? It is really a work of art." In the brief conversation that followed the writer found out that the passenger was a doctor in one of our eastern cities, and, incidentally, a man that traveled very little—but he took notice of the railroad.

It does not cost as much to make a railroad beautiful as one would at first suppose. When track is being worked over it is just about as easy to put it up in the way it should appear as to put it up in a bad, haphazard looking way. It does not require much effort to line ballast in a straight line outside of the ties, but it makes a mighty big difference in the appearance of a railroad. It does not cost much to keep the right of way cleaned of old ties, broken rails, drawheads, etc., but it makes the difference between a well kept railroad and one that is not well kept. It does not cost very much to keep signal posts, semaphores, switch targets, cattle guards, stations and buildings painted well, but it makes a great difference in the eye of the public, and keeps Old Demon Rust and Decay away.

Our yards and terminals could be improved a great deal, too, by a little extra janitor service now and then. A gang of men can clean up a dirty yard in one day to make it look like a polished brass knob. Anyone knows what a difference it makes in the appearance of a yard to keep old waste paper cleaned up, to rake up coal that has been knocked off along lead tracks, and to keep scrap picked up.

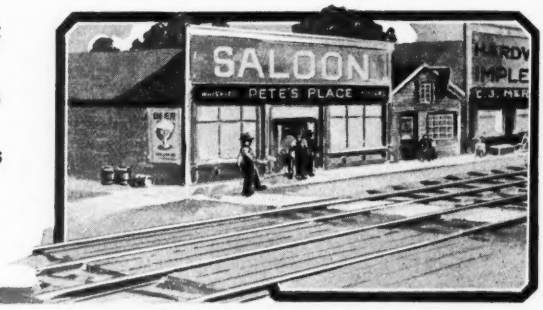
Every railroad should make it a policy to keep its property in the best possible appearance. It is a good practice from more than one standpoint. It not only has a good psychological influence upon the outsider, but it teaches the inside man to do his work in a clean, efficient way, to not let scrap iron lay around—to not make scrap iron, to not tear up cars and switches.

If a man goes into a store and sees everything dirty and in disorder and finds poor service, he will not go there again; he will go to the well kept, clean, orderly store, where he finds prompt and courteous service. It is no different with a railroad. The passenger will not go to the dirty railroad the second time if there is another better railroad to go to; he will go to the clean, well kept road, where he knows everything is all right, where he will get through safely and on time and have a journey that is a pleasure.

C. H. CARPENTER.

THE TRACK LABORER AND LIQUOR LEGISLATION

An Investigation of the Effect of Prohibition Laws on Maintenance Forces in Several Western States



THE American hobo has long been noted for his fondness for liquor and maintenance men have come to expect that pay day among these men will be followed by their absence from work for several days. When sober the hobo is the most efficient track man available. He is a native American familiar with our language; he possesses a wide track experience gained in his wanderings from one road to another; if well fed, he is usually willing to work hard and he is particularly efficient in the more complicated track work, such as the laying of switches, etc. His weakness is his inability to resist the temptation to drink as long as he has any money. His ambition is to acquire a "stake" of $15 to $20, when, in his parlance, he "is due" and he "blows." As a result hobo gangs are demoralized and the work is brought practically to a standstill at every pay day.

The hobo is primarily a native of the middle and far western states and it is in this territory that prohibition has made its greatest advance in the last few years. In order to ascertain the effect of this legislation on the hobo and also on other classes of native and foreign track labor, a letter of inquiry was addressed to several railway men in charge of maintenance work in Arizona, Colorado, Idaho, Iowa, Oregon and Washington, all of which states have now been "dry" for approximately a year. These localities, therefore, afford an opportunity for a comparison between conditions which existed last year under "wet" conditions and those of the present year of prohibition. In the letter of inquiry, information was solicited regarding the effect of prohibition legislation on the supply of labor available for track work, on the regularity of the men at work and on their efficiency, this information being of special interest at present when the supply of labor is particularly inadequate. The replies which were received appear below:

IN DRY ARIZONA

Our road operates in Arizona, New Mexico and the western extremity of Texas, of which territory Arizona only is dry. The river counties along the Rio Grande frontier of Texas are still wet. I have no definite figures showing the effect of prohibition on track labor in Arizona. It would perhaps not be wise to attempt definite conclusions at this time on account of the very abnormal and unsettled labor situation along the Mexican frontier due primarily to war conditions and resulting in a great scarcity and continual shifting of labor almost exclusively Mexican on the border.

Notwithstanding bootlegging which will doubtless continue until the manufacture of liquor is stopped, prohibition in Arizona has reduced the consumption of liquor therein. Merchants and directors of industries generally find the results beneficial, first in increased business and prompter payment of their bills and the second in increased efficiency and reliability of labor. This is more marked in the smelting and mining centers where labor is congregated in communities formerly having the open saloon facilities.—*J. L. Campbell, engineer maintenance of way, El Paso & Southwestern.*

TRACK LABOR IMPROVED IN ARIZONA

The condition of the laboring man, as well as that of his employer, has been improved so materially since the advent of the prohibition legislation that if the issue were to be resubmitted to the men affected, excluding all others from the opportunity of expressing themselves, the prohibition laws would be again sustained. The monthly drunk became a semi-monthly drunk with the advent of the semi-monthly pay day, but they ceased to be a feature altogether with the advent of the prohibition legislation.

The fact that "bootlegging" began with the advent of such legislation, and still continues, is not a factor in this discussion, for the reason that the chances to be taken by the "bootleggers" are too serious for the practice to become common enough to be within easy reach of our employees. Moreover, with each test of the laws before the courts, or before subsequent sessions of the legislature, the construction placed on the rulings have become more stringent rather than lax. Convictions for "bootlegging" are now taking the form of penitentiary sentences, which has a very discouraging effect on the would-be perpetrator. Therefore, any discussion that may be offered by the proponents of the "wets" are simply additional illustrations of "grasping at the last straw," so common to humanity in death struggles.

Another feature in connection with the prohibition legislation that has been particularly prominent in this country since the advent of this legislation is the absence of acts of extreme vandalism and homicide usually attending labor disturbances in other states, and formerly

so in this state. The state has gone "dry" to stay, and all concerned, employee, employer and merchant, are the beneficiaries.—*J. D. Mathews, division engineer, Southern Pacific, Tucson, Ariz.*

NATIVE LABOR BETTER IN COLORADO

I have delayed advising you regarding the effects of prohibition on the quality and quantity of track labor in Colorado until I have had some of my observations verified by superintendents. I find that there is a unanimity of opinion about as follows: The declaration and prosecution of the war in Europe played havoc with labor conditions in Colorado because of the fact that so large a percentage of unskilled labor was furnished by individuals of foreign birth. This unfortunate occurrence, following so closely upon the legislation making Colorado a prohibition state, renders it very difficult, if not impossible, to determine the effect of prohibition on track labor. Such conditions have been further aggravated by the declaration of war on Germany by the United States.

Still another condition which must be given consideration lies in the relation of Colorado to its neighboring states. Joining it on the north is Wyoming, on the south New Mexico and on the west Utah. These three states were all in the "wet" column until a little over a month ago, when Utah joined the ranks of prohibition, New Mexico and Wyoming still remaining "wet." The facts are, therefore, that laborers from those nationalities accustomed to the use of alcoholic beverages have left Colorado for communities in neighboring commonwealths where "booze" can be obtained freely. As a result there is a shortage of foreign laborers at present, but, eliminating the scarcity directly traceable to demands of warfare, the quantity of native labor has remained constant.

There would seem to be little doubt as to the effect of prohibition on the quality of both skilled and unskilled workmanship. We notice particularly the results in the service rendered by some of our older employes who were formerly accustomed to going off on periodical sprees. This has been practically eliminated and is especially apparent in the constant, regular and loyal services of these men. In other words, their services have unquestionably been improved by the banishment of the manufacture and sale of intoxicating liquors within the state boundaries.

Notwithstanding the fact that owing to the conditions mentioned above, railroad labor in Colorado is a serious problem just now, all who have to do with the acquisition and expenditure of labor on the railroads are unanimous in the opinion that prohibition will undoubtedly not only be remunerative but conducive to permanent and undisturbed labor conditions in the future.

From the little experience thus far acquired it is evident beyond dispute that when the adjoining states of Wyoming and New Mexico shall have joined with the prohibition majority, railroad labor in Colorado will be more efficient, more plentiful, more undisturbed by local conditions and much more easily controlled than ever before. We feel that after all it is the best move which has ever been made in the improvement of the laboring man's condition and in returning to the employers the greatest value for the wages paid. In other words, since all value may be said to represent labor, any increase in the quantity or improvement in quality of labor means an increase in the wealth of the community, commonwealth and nation. Colorado will never return to the "wet" column.—*Arthur Ridgway, assistant chief engineer, Denver & Rio Grande, Denver, Colo.*

MONTHLY SPREES DISAPPEAR IN IDAHO

In ordinary times we have worked hobo labor on track only when no other labor was available, principally because, in our territory, the hobo is just passing through, and does not stop to work unless his stake has run completely out. If he does work where there is a saloon in the neighborhood it is only until he has made a new stake, and the saloon soon has that, and the hobo probably goes back to work again somewhere in the neighborhood for another short spell. Later when this territory went dry the hoho still had to have his booze, and got it when possible, at a much higher rate through bootlegging channels.

There is no doubt but that the hobo will work longer at a time at various points where there are saloons. On the other hand, with local laborers or foreigners, the absence of the saloon shows very desirable results, as money which ordinarily went for booze now largely goes to paying bills at the grocery stores and clothing and schooling for wives and children, and general paying of all debts. Also there is not the customary spree of from one to four days' duration every month, while there are not the accidents, and nothing like the worry of officers responsible for safe movements of trains. There is more attention to duty, less quarreling an better feeling between the foremen and the men where local labor is used since the saloons have gone out of business.

The hobo is in a class by himself, the most intelligent and hard working laborer when he will work at all, and the most good-for-nothing, worthless laborer we have when he has any money in his pocket, and wishes to find an excuse to go and drink up his stake.

Under ordinary conditions and in ordinary years in this territory I much prefer to handle our large number of laborers without saloons.—*R. B. Robinson, engineer maintenance of way, Oregon Short Line, Pocatello, Idaho.*

LABOR STAYS IN IOWA

There never was a law passed which was more beneficial to the public than that prohibiting the sale of liquor. Especially is this law advantageous to the railroads. This law has now been in effect in Iowa long enough for us to see and appreciate the great loss of time we were subjected to during the days of the saloon. Now that the saloons are gone, a roadmaster does not have to think of some foreman or bunch of laborers being drunk. The foremen are always on the job, as are the laborers, also. The men are steady and are settling down very fast to be regular men. Many foremen and laborers are buying their own homes.

It was thought that prohibition would drive all of the foreign laborers to "wet" states, but it has worked just the opposite. These men seem to want to get away from the booze and they are free to say, "We have families and want to save money." The hoboes in extra gangs, who usually worked three days to three weeks and drew their pay to get drunk, have changed. One gang of 30 of these men was paid off at the camp every 15 days this season and not one got drunk or left during the 60 days that the job lasted. We get more and better work from the men and the foremen can be trusted to perform their duty more fully than formerly.—*F. E. Crabbs, roadmaster, Chicago & North-Western, Ames, Iowa.*

LABOR SHORT IN WET AND DRY STATES

I am unable to find any difference in obtaining hobo labor either in the "wet" or "dry" territory. The "hobo" labor is extremely short everywhere. We have been very

short of "hoboes" this season in both the wet and dry territories. For instance, in Illinois, where we tried to get four "hobo" gangs of 65 men each we only got two gangs having 25 to 30 men in each gang. In Iowa we have endeavored to get four hobo gangs for laying rail and we have managed to keep 20 to 25 men in each of three gangs, while the fourth gang was disbanded on account of inability to get men. The last mentioned gang was close to Rock Island, where the men could have gone for their liquor supply.

We have found in Iowa and Nebraska that the higher rate of wages that is being paid this year has helped to get more native help than we have had in the past. The foreign labor has been very uncertain and there has been a great deal of changing from one place to another. They are inclined to go to those places where they can obtain the most wages, and we find it difficult to hold men near industrial centers or cities doing a large amount of street work at the present time.—*W. H. Petersen, engineer maintenance of way, Chicago, Rock Island & Pacific, Des Moines, Ia.*

CONDITIONS IN NEBRASKA

The elimination of the saloon in Nebraska has been a great factor in the improvement of the efficiency of most classes of track laborers. Prior to May 1 of this year, at which time the state went dry, most of the smaller towns along the line had voted dry, but the larger towns with saloons were in such close proximity to these localities that they were a drawing card for the men, and we experienced much difficulty in holding them for any length of time, as it only required a small stake to get them back where there was more excitement. Since the entire state went dry this condition has been greatly improved.

We have worked more white men of the drifting class during this working season than ever before and their performance has been satisfactory. Of the several hundred men employed on this district at various times this year we have had no drunkenness or disorder of any kind to contend with, the men being made up of white, colored and Mexican labor of the drifting class. I think this would be a very difficult record to duplicate in wet territory.

The showing made as to regularity in attendance at work has been very good. It has also been satisfactory from the standpoint of efficiency, considering the generally unsettled conditions, much better than could have been secured with booze to contend with. A number of men have left to take up farm work, induced by the high wages paid this year through this territory owing to the scarcity of labor, but as yet we have seen no marked tendency among them to leave track work for better paying industries. I believe that the majority of the drifters prefer track work, and will stick to it if properly handled and taken care of, provided wages are also kept up so as to compare reasonably well with other lines.

Too much cannot be done to improve the living conditions of the track laborers. Good sanitary living quarters, clean, comfortable beds and wholesome food will go a long way toward offsetting the inclination to drift into the saloon town and will be one great inducement for a better class of men to take up track work. I think that as long as we have saloons in the country they will draw our drifting labor, but the farther the men are removed from them the longer they will stay out, and the better will be the results which will be obtained from them.—*D. F. Newmyer, roadmaster, Union Pacific, North Platte, Neb.*

IN OREGON

Oregon did not go "bone dry" until February of this year, and the prevailing abnormal conditions resulting from the war are such that I do not believe any conclusion now arrived at can be taken as final. However, I believe that genuine hobo labor is gravitating toward the "wet" states. As far as our native white labor is concerned, I believe that prohibition has affected considerable improvement in that the men work more steadily and are more dependable, and the living conditions of the men and their families have improved. The same conditions apply to our resident foreign labor.—*H. L. Lyon, division engineer, O. W. R. & N., La Grande, Ore.*

MEN STAY LONGER IN WASHINGTON

I have had many opportunities to observe the benefit that has been derived from the prohibition of intoxicants. It has brought about a wonderful transformation wherever it has gone into effect. The men are altogether different; they are ready and do go to work upon their arrival at points where work is under progress instead of having to lie around camps to sober up. They are also better clothed and do not have to endure the hardships which would otherwise be the case. The men also remain longer on jobs, as there is less inducement to return.

We do not seem to experience much, if any, difficulty from other nationalities. I attribute this to the fact that the families and relatives of our foreign laborers live elsewhere, which makes it an incentive for them to strive to save instead of spending their money.—*J. J. Hess, engineer maintenance of way, Great Northern, Spokane, Wash.*

INCREASES I. W. W. IN WASHINGTON

The Washington prohibition law went into effect on January 1, 1916. It prohibited the manufacture and sale of liquors, but by a permit system the importation of limited quantities was allowed until June, 1917, when federal legislation eliminated this arrangement. Naturally, the first few months constituted a period of adjustment, with considerable bootlegging, uncertainty of law enforcement, etc. Following this was a period approaching normal. Labor supply was rather in excess of demand, but not greatly so.

While this condition prevailed, there was, according to my observation, supplemented by numerous inquiries, an increase in efficiency and steadiness of this class of labor. The men stayed on the job longer than in previous years. Contractors reported fewer accidents and an absence of the payday hangovers, and were generally pleased with the results. I have not noted much tendency toward working into better jobs, but am inclined to think that this will develop. These remarks will apply as well to the class of men working at the rougher kinds of skilled and semi-skilled labor as to common labor of the "floater" variety.

This condition continued until last spring. At that time, and since, there has been a decided excess in demand over supply for this labor. There is now no difficulty in getting a job. The laborer apparently looks on it as a bank. A few days' work is equivalent to a check. He draws this check and in less than a week has a "stake" of $15 to $20. Here comes the difficulty. Where formerly in boom times a like practice was followed, the stake lasted a day or so; now it is good for a week, or perhaps two, and the hobo, with money in his pocket, idles for that length of time. I believe that this ac-

counts for a large portion of the following of the I. W. W. in this section at the present time, for there is no better recruiting ground for such than a body of idle men of this class with money enough for their needs in their pockets. We must grant, however, that this present condition is abnormal, and I believe that the second period referred to is a fairer criterion over an extended time.

I can hardly be classed as a prohibitionist, but I feel free to say that the general sentiment is more strongly in favor of prohibition in this state than at the time it was voted on.—*Maintenance Engineer.*

The Bonus System for Maintenance Work*

BY W. C. NISBET

OF the various special methods which have been developed to assist or improve industrial work, that of planning and dispatching is probably of the greatest and most general use. Some features of this method can be employed in maintenance of way work and these are here presented in the hope that they will prove of some value.

PLANNING

Planning in this connection is the advance study given any proposed work to ascertain the best time, place, method and material and the proper force and the reduction of this information to convenient graphical form for use during the continuance of the work for the general purpose of co-ordinating the several jobs, and to enable the supervisor to have the proper forces and materials available at the proper time and in the proper place. In effect it is a graphical representation of the season's work of a subdivision, prepared in advance and kept up to date as the work progresses.

DISPATCHING

Dispatching is considerably simpler, being merely a definite method of issuing formal instructions to foremen from the roadmaster to do the work planned, telling what to do and when to do it, and the amount of time considered to be sufficient for its accomplishment. Dispatching relieves foremen of the uncertainty which verbal orders frequently create. The roadmaster keeps a carbon copy of each dispatch. This arrangement tends to hold the force to a definite plan and discourages the tendency sometimes observed to skip around over the section, working a few hours at one place and then going somewhere else. It is recognized that this may be highly necessary at times. What is criticized is when the occasional grows into an undesirable habit.

The dispatch which the foreman receives gives a list of the items of work assigned for the next week or two-week period, and the standard hours considered sufficient for each item. There is no compulsion about performing the job in the time indicated, but it serves to strengthen the foreman's idea of the relation between the job to be done and the number of men furnished for the work. To illustrate the advantage of working to known standards: Anyone gets an entirely different conception from (1) a suggestion to take a walk, and (2) a statement that he is expected to walk to X, a distance of 3 miles and that 45 min. is considered sufficient time. There is no question whether method 1 or 2 will result in covering the distance in the least time.

In all railway work there are occasional accidents or other emergency work which compel sudden changes of plans. The planning system recognizes this and frequent revisions are expected which to not affect the net result. As to the dispatches already issued in such cases, a note may be printed on them to the effect that in case of accident or other emergency the regular plan may be disregarded and special orders issued or that the foreman will use his best judgment in the absence of special instructions.

Copies of dispatches retained in the roadmaster's office serve as a convenient and definite reminder of the work that has been ordered. They may be filed on wall hooks under the proper section number. The dispatches should be numbered and the foremen should return them when completed with a notation to that effect and the date.

The roadmaster will naturally decide what dispatches the foreman should receive regarding the nature of work, time to begin, etc., but their actual writing may be turned over to his assistant in this system. This track inspector can enter the standard hours quickly from his list of schedules.

TEMPORARY SCHEDULES

For work on which no standard time has been formally set, as, for instance, ditching a cut or unloading a cart of salt, the roadmaster may be allowed to estimate the time in which the job can be accomplished by working industriously and by proper methods he will give this time on the dispatch and it will be used later in computing the performance of the gang for the pay period. Suppose the job is ditching a cut which it is estimated will require six men's time for one week. The dispatch would read, "Ditch cut north side of tracks telegraph pole 50/20 to 50/40, time 360 hours." If the job required the time of the foreman and six men for 5 days, the total time required would be 350 hours (7 men x 10 hours x 5 days). For this much of their time, then, the gang would attain a performance of 103 per cent.

Such schedules as these are called temporary schedules and are to be applied freely by the roadmaster in order that as far as possible all gangs may be working on jobs where their results may be measured by standards. As a check on the pains taken and the accuracy of the roadmaster in issuing such schedules, it is well to tabulate them monthly and see that the average performance of all gangs on such schedules is neither unduly high or unduly low. Engineer officers will find when this method of planning and dispatching is adopted it will have the welcome effect of getting the roadmasters to give the problems of each section considerably more personal study than is common otherwise and not leave the responsibility almost entirely to the foremen.

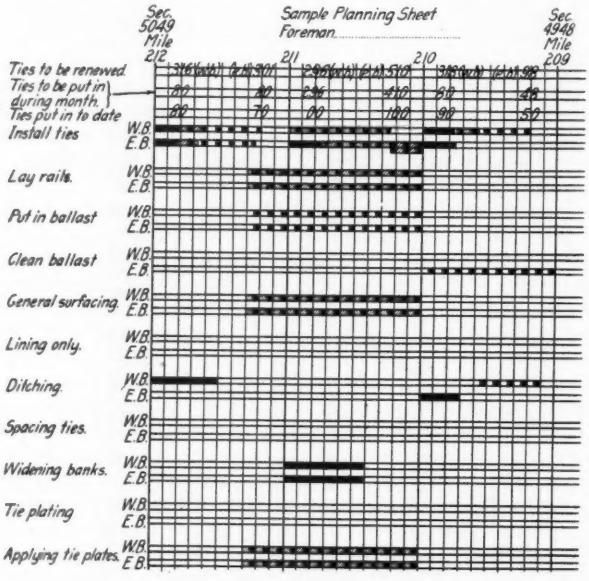
The planning sheet shown here is intended to represent one sample section from a continuous chart showing an entire subdivision. The space entitled "Ties to be renewed" is to show the number of ties each track should receive and is taken from the report of the tie inspector, roadmaster or other officers delegated to make the in-

*This is the second of a series of articles on this subject. The first article appeared in the October issue, page 310, and others will follow in succeeding numbers.

spection of ties. The space marked "Ties to be put in during month" is to show the number of ties which it is planned are to be put in the month following. The meaning of the space marked "Ties put in to date" is self-evident.

It is the intention to change this chart at the end of each month and show the situation say as, for instance, of May 1 with "Ties to be put in in May" and "Ties put in to date" up to May 1.

The space headed "Install Ties," with both tracks shown, shows in heavy dash lines the season's requirements. In this instance the mile is divided into ten parts, each one to indicate 40 ties, allowing an allotment of 400 ties or less to be indicated conveniently. If we come to a mile with very bad ties, needing say 800, the width of the dashes may be doubled for the entire mile space, the purpose being to have the graphical representation indicate plainly and readily at a glance where the work is light or heavy and what the status is at all



A SPECIMEN PLANNING SHEET

times. To indicate the monthly program for each mile, the space between the dashes may be cross hatched, using the same scale as previously described for the season's requirements. To indicate the amount put in to date, ink in the space between the dashes and thus show a solid line.

Some engineers have used different colors to indicate (1) work planned for the season, (2) work planned for the ensuing month, (3) work completed. The objection to such a color scheme is that it will require coloring each blue print with considerable labor.

It may be observed that the above indications for the tie situation are to some extent in duplicate as the figures are shown, followed by the same information in graphical form. Either set may be omitted if desired. However, the figures are valuable and are desired by most users while the graphical form is particularly convenient for the division engineer or engineer maintenance of way in going over the chart to see the general situation on each mile.

"Lay Rail" is shown graphically by marking the chart at the geographical point and for the distances where it is actually to go, using dashed lines for the season's requirements, with open spaces hatched to show the next month's laying and with solid lines for the amount laid to date. The ballast program is shown in the same manner. The distinction between stone, slag, gravel or chats ballast can be shown by colors, by different dot and dash lines, or by marking the particular kind below the space, "Clean Ballast" shows where stone ballast is to be cleaned for a distance continuously.

The "General Surfacing" spaces may be used to show track raised completely, in distinction from raising low joints. The "Lined Only" spaces are for special lining, aside from the lining which accompanies surfacing and ballasting. Ditching, Spacing Ties, Widening Banks, Tie Plating, Applying Anti-Creepers, etc., may be given separate spaces or blank spaces may be left and filled in as needed.

The chart illustrates a three-mile double track stone ballasted section extending from M. P. 209 to M. P. 212. The program of work shown is not offered as a model, but only as an illustration of the method of preparing the planning sheet. Tie renewals are on the basis of about 300 to the mile except the E. B. mile from M. P. 210 to 211, which is assumed to have bad ties and to require 510 to put it in good condition. E. B. mile from 209 to 210 is supposed to be in good condition and to require but 98. In general the policy illustrated here is to extend the tie renewals over four months, doing about one-fourth of each mile each month and to work some on all miles, renewing the worst ties there instead of going continuously from one end of the section to the other. An exception is the distance from 210 to west of 211 on both tracks where the new rail is to be laid and surfaced immediately. For this distance the tie renewals would be handled with the surfacing as the latter progressed.

The rail is presumed to be laid by an extra gang the first part of the current month and the surfacing and application of anti-creepers to follow immediately and be completed the same month. Ballast will be replenished where the general surfacing takes place, but not in the current month.

The program indicates that no extensive ballast cleaning is contemplated for this section except on the eastbound track from M. P. 209 to 210, which is not to be started during the current month. Ditching is shown completed in two places and still to be done in a third. Widening banks is also shown to have been completed.

No spacing of ties or tie plating is indicated for the season's work on this section. Actually, of course, the ties would have to be spaced where the rail was laid unless straight angle bars were used and the joints allowed to be either supported or suspended as might happen.

GENERAL

It is desirable that the planning sheet be made out at the beginning of the season by the division engineer and the roadmaster working together, giving both a more complete and detailed knowledge as to just what and where the entire season's work is to be than they might otherwise have.

If it is made on tracking cloth like a profile prints may be sent to the division engineer, the engineer maintenance of way or others interested at each revision.

These planning sheets may be made if desired on separate sheets, one for each section, or the entire sub-division may be shown on a long roll or strip, the latter being preferable on account of its continuity. The strip may be tacked on the wall of the roadmaster's office for convenience.

It may be thought that the foregoing planning and dispatching system will require the services of a small

army of clerks to keep it up to date, but like many other similar records in practice it is much less difficult than might at first appear. In actual use the roadmaster's assistant, or, as he may be called for this work, the track inspector, can bring the planning sheets for a sub-division of 60 miles up to date in three hours each month. Of course, the original preparation takes considerably longer. The dispatches are usually prepared at two-week intervals for the whole sub-division for the ensuing two weeks, the roadmaster and his assistant being able to do this in two or three hours.

The completed planning sheets become valuable records in following years, as they show clearly the work which was completed at different points and also that which was planned but not done.

Many roadmasters undoubtedly have the knack to carry in their heads the location of new rail, ballast and heavy tie renewals, where the ditching is needed, etc., but others lack this faculty and in the long run records are infinitely better than the unaided memory. Further, roadmasters and foremen are often changed and it is of great service, in fact almost necessary, to have such details in permanent records. Some of this information is, of course, on file in some form in the division office, but such data as the location of tracks raised, ditching, ballast cleaned, lining and tie spacing and many other items are not generally available for the convenient use of a roadmaster who has just been appointed. The charts recommended will be of the greatest assistance in his office.

It is not the intention to claim that all of the foregoing arrangement is new. Many division engineers are in the habit of preparing a condensed profile each season which shows new rail and which also frequently indicates the number of ties to be renewed on each mile and where the ballast is to go. Sometimes these figures are revised from time to time to show the situation during the season.

The method recommended, however, carries the practice considerably farther and puts a complete copy in the hands of the roadmaster who is naturally greatly concerned in the matter. The method described has been found practical and useful and will be of service in making maintenance of way work less subject to chance and individual opinion and more systematic and definite. The net result of this will surely tend toward economy.

PENNSYLVANIA TRACK INSPECTION

THE awards of the annual prizes for maintaining sections of roadbed in the best condition during the past year were announced on October 10 by Assistant General Manager R. L. O'Donnel of the Pennsylvania Railroad. These awards are usually announced during the general manager's inspection trip over the main line, but owing to the effort the Pennsylvania Railroad is making to keep every available locomotive in freight service, it was decided to omit the inspection trip this year.

The first premium of $1,200, of which $800 goes to the supervisor and $400 to the assistant supervisor having the best line and surface between New York and Pittsburgh, and between Philadelphia and Washington, was awarded to W. T. Hanly, supervisor, and B. M. Frymire, assistant supervisor, in charge of the track from Marysville, Pa., to Durward. Four premiums of $800 each, $600 for the supervisor and $200 for the assistant supervisor, for the best line and surface on a main line superintendent's division between New York and Pittsburgh, and between Philadelphia and Washington, were awarded to L. J. Fairbank, supervisor, and J. B. McWilliams, asistant supervisor, in charge of track from Linden, N. J., to Plainsboro; C. Z. Moore, supervisor, and E. B. Callow, assistant supervisor, in charge of track from Dillerville, Pa., to Harrisburg; T. E. Lightfoot, supervisor, and G. H. Stewart, assistant supervisor, in charge of track from New Florence, Pa., to Donohoe, and to G. M. Ball, Jr., supervisor, and R. H. Helick, assistant supervisor, in charge of track from Perryville, Md., to Back River.

A special improvement premium of $1,000, $700 to the supervisor and $300 to the assistant, for the greatest improvement made in line and surface on the main line between New York and Pittsburgh, and between Philadelphia and Washington, was awarded to Supervisor J. E. McIntyre and Asistant Supervisor E. D. Flad, who have charge of the track between Durward, Pa., and Longfellow.

To insure the premiums being awarded upon accurate data, a committee of maintenance of way officers went over the line every month during the year in a car attached to one of the regular high-speed trains. This special committee was composed of W. G. Coughlin, engineer of maintenance of way; C. H. Niemeyer, assistant engineer of maintenance of way, in charge of roadway and track; L. W. Allibone, superintendent of the Sunbury division, and J. K. Johnston, superintendent of the Tyrone division.

"SMOKES" FOR RAILWAY TROOPS

THE railway regiments which have been raised and those which are being organized for service in Europe are composed of former railway officers and employees. These members are making great sacrifices for their country, and whatever the railway and railway supply men who stay behind can do to show their appreciation of what the members of the railway regiments are doing, ought to be done.

With this in mind a movement has been started among the railway supply companies and railway supply men of the United States to raise a "Railway Regiments' Tobacco Fund." The movement was initiated by F. A. Poor, president of the P. & M. Company, Chicago, and a committee has been organized to make this plan effective, which is composed of the following: F. A. Poor, chairman; R. P. Lamont, president, American Steel Foundries; George A. Post, president, Standard Coupler Company and the Railway Business Association; E. H. Bell, president, the Railroad Supply Company and the Railway Appliances Association; J. M. Hopkins, president, Camel Company; A. C. Moore, vice-president, Safety Car Heating & Lighting Company, and Samuel O. Dunn, editor, Railway Age Gazette, secretary.

In a short time circular letters will be sent out by the committee in charge of the raising of the Railway Regiments' Tobacco Fund asking railway supply concerns throughout the United States to subscribe to this fund. It is desired to arrange for a total of 2,160 lb. of tobacco weekly for all the nine existing railway regiments, which will cost $1,080 a week.

The committee in charge of the raising of the fund estimates that if 450 railway supply concerns will subscribe the $10 a month requested a sufficient fund can be raised for providing "smokes" for all the members of the nine existing railway regiments. Additional regiments are now being raised, but it will be some time before they are ready and no effort is being made at present to provide for their probable wants.

The members of the committee especially desire that it should be understood that all the money raised will go into the tobacco fund. In other words, there will be no expense conected with the collection and administration of the fund.

General Arrangement of Camp Grant, Near Rockford, Ill

TRACK CONSTRUCTION AT THE CANTONMENTS

A Description of the Manner in Which the Necessary Facilities Have Been Provided in Minimum Time

ONE of the important considerations in the selection of the 16 sites for the cantonments was the availability of transportation facilities. However, although a location might be selected adjacent to one or more railways a large amount of additional trackage has been necessary at each one of these points to enable the construction materials and later the troops and other supplies to be handled promptly. Tracks were necessary at each one of these cantonments before the contractors could unload their equipment or their construction materials. With almost no advance notice the railways were called upon to assemble materials for from 5 to 15 miles of tracks and to organize forces to lay them in the least practicable time. This problem would have been difficult at any time, but it has been particularly so this year when new materials cannot be secured on short notice and when there is not enough labor available to do the work already under way. That the railways have been able to provide the desired tracks with little or no delay to the contractors or to the government under these adverse conditions is a performance of no small magnitude. Because of the excellence of this record and the general interest which this subject possesses for railway men, we give below a somewhat detailed description of the manner in which these tracks were provided at Camp Grant, a middle western cantonment at Rockford, Ill., and in somewhat less detail at Camp Upton, an eastern cantonment at Yaphank, L. I., and at Camp Pike, a southern cantonment.

TRACK CONSTRUCTON AT CAMP GRANT

By C. J. McCarty

Assistant Engineer, Chicago, Burlington & Quincy, Chicago, Ill.

Camp Grant, one of sixteen cantonments under construction in the United States, covers an area of 2,278 acres lying along the easterly and southerly bank of the Rock river, in Winnebago county, Illinois. The reservation is approximately three miles in length, the center being 4 miles south of Rockford, Ill. The main track of the Flag Center to Rockford branch of the Chicago, Burlington & Quincy, operated jointly with the Chicago, Milwaukee & St. Paul, and the main line of the Chicago, Milwaukee & Gary, extend through the easterly portion of the cantonment grounds from north to south. Crossover connections at the camp on adjacent rights of way and connections at Rockford with the Illinois Central and the Chicago & North Western afford excellent transfer facilities.

Practically all the government property is lightly rolling farm land, the soil being light sandy loam, with deep gravel and sand subsoil, offering good natural drainage. Except along the Rock and Kiswaukee rivers, the latter flowing through the southly limits of the cantonment, the topography was well suited for rapid railroad construction.

Plan of the Camp

The major portion of the buildings are located systematically along an axis extending southwesterly from the railroads, at an angle of 19 deg. 21 min. with the railroad tangent. A broad street 1,000 ft. wide, 500 ft. each side of the axis, provides a clear space for troop formations. One hundred and fifty feet each side of the axis and parallel to it, temporary tracks have been constructed with numerous spurs, the entire length of the building frontage, about 4,500 ft., according ample switching and unloading facilities and practically forming a four-track railroad. Government regulations required that adequate fire space be maintained between lumber piles and building lines and this arrangement permitted 250 ft. of clear space for a fire break.

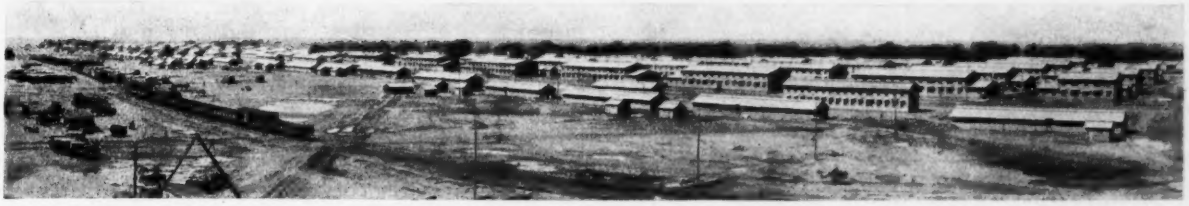
Twelve spurs were built from the axis tracks varying from 430 ft. to 1,300 ft. in length, the ends being thrown out and lapped by the succeeding turnout to form an almost continuous unloading frontage. An additional lead 6,900 ft. long was laid to the north along Kiswaukee road to serve the construction of the hospital, engineers, artillery, ammunition and supply train units, with nine 430-ft. spurs, the length of 430 ft. representing the frontage on a unit of buildings.

Practically all of the material was hauled directly from the cars to the point of consumption by teams or trucks, material being piled only to relieve congestion of cars. A maximum force of 8,000 men consumed material, usually, as rapidly as it could be unloaded. At present a third temporary lead about 4,000 ft. long is being constructed, with several spurs to accommodate the construction of 550 additional buildings in the northwesterly part of the tract along the Rock river.

It is planned to remove the temporary tracks as rapidly as possible for relaying in permanent work. Eight and three-tenths miles of temporary tracks have been laid on government property and 1.4 miles on railroad property.

The Permanent Tracks

The permanent track plan, begun shortly after the construction of the camp was begun, consists of a five-track sorting yard adjacent to the Burlington right of way with a capacity of 110 cars. Three of the tracks have been completed. Space for three pairs of team tracks provide room for 200 cars, each pair 13½ ft. center to center, the pairs having a driveway spacing of 45 ft. center to center. The westerly two pairs have been com-



General Arrangement of Camp Grant, Near Rockford, Ill.

pleted and will be connected at each end on a 1 to 6¼ ladder having direct connection to the main line. In addition to use as team tracks it is planned to make use of these tracks for entraining and detraining troops. Ramps will be provided for loading wagons, by methods similar to those employed in handling circus trains.

Adjacent to the team tracks on the west a running track 3,400 ft. long has been constructed, from which six spurs, each 600 ft. long, have been built. Each spur serves two warehouses, each 168 ft. by 80 ft., with a fire break of 100 ft. between buildings. Spurs and running tracks are laid 18 ft. center to center and No. 7 turnouts are used. A refrigerator plant is served on a separate track.

A 50-ft. 100-ton track scale with dead rails has been built on a concrete base with timber side walls on the lead to the yards, and team and warehouse tracks. Drainage is taken care of by sumps.

Coal storage will be made from a 400-ft. coal trestle with a 300-ft. 5-per cent approach. The trestle will be 15 ft. high and located at the southerly end of the permanent yard. This will be strictly an emergency supply, the daily supply being hauled directly from cars spotted on the team tracks. So far as known no provision is made for the use of labor-saving devices and it is assumed that a maximum of 400 tons per day will be teamed to 16 heating plants located throughout the cantonment property. Permanent tracks are provided at New Milford, 1½ miles south of the camp, for a remount station with a 200-ft. unloading platform and corrals for 15,000 horses and mules. A switching track will be extended to the ordnance warehouses. The permanent trackage will total about 5.3 miles on cantonment grounds when completed.

FREIGHT AND PASSENGER FACILITIES

A frame passenger station 45 ft. by 151 ft. with a 34-ft. portico on the north end, located about opposite the administration buildings of the camp, provides room for baggage and express. A restaurant building 140 ft. by 30 ft. will provide lunch for passengers. A brick platform 10 ft. by 800 ft. extends from the highway north of the station facilities, south to a subway, provided for the movement of troops below the grade of all tracks, to the maneuvering grounds east of the railroads. An over-crossing near New Milford will afford safe passage at this end of the property. These facilities were provided on orders from Washington directing that all troops must cross railroads above or below grade.

The Rockford & Interurban Electric railway is constructing a single track line from Rockford adjacent to the Burlington right of way and will operate interurban cars at five-minute intervals during rush periods. A loop will be built within the cantonment property with yard room and a turnstile system of handling passengers.

CONSTRUCTION

The main track of the Burlington is laid with 85-lb. rail and that of the Chicago, Milwaukee & Gary with 70-lb. material. Temporary tracks are laid with 75-lb., 66-lb. and 60-lb. rails. All curves leading from the main line are laid with 75-lb. or 66-lb. rails. The axis tracks are practically all of 60-lb. rail. Ties of all descriptions were furnished and laid as rapidly as possible without regard to location, except that all curves were laid with hard wood ties. Important turnouts on railroad property were laid with switch ties and all ties and fastenings as well as the turnouts were new material. As a rule all temporary tracks were surfaced with native soil dug up at the side of the track. Cinders were used on important curves and weak spots. All permanent tracks were ballasted with cinders from Chicago.

The wage scale conforms to that of the camp contractor for common labor, 35 cents per hour for an 8-hour day and time and one-half for overtime. Based on an 8-hour day with 10 hours work the rate per day was $3.80. The Burlington constructed comfortable quarters for track laborers with sleeping accommodations in tents with raised wooden floors and wooden side walls three feet high, and "built in" bunks. The board was supplied by J. J. Greer of Chicago in a frame building constructed to accommodate 165 men. Efforts were made to provide accommodations at least as good as those furnished by the cantonment contractor.

A pressing demand for the use of the temporary tracks as fast as laid prevented economical construction to a great extent. Track material was pushed out as far as possible, unloaded and hauled by team to the new work, preference being given to government material. The greater part of the temporary track work was laid across corn and oat fields with no time to cut the oats, then waist high. The engineers in staking out the lines set laths on all 50 ft. stakes as a guide for teams hauling rail and ties. Close watch of the foreman permitted the material to be unloaded and properly spaced with very little need of subsequent shifting. As a rule, track ties of hardwood were laced for switch ties, head blocks only being furnished. As far as possible each day's track laying was made a complete job to allow its use for unloading purposes the following day, even at the expense of progress on the work as a whole. Track once in use was found occupied continuously with few intervals for surfacing during the day. As rapidly as possible, tracks that could be spared were released for use at other points in the cantonment.

Ties were spaced 24 in. center to center except on the ends of spurs where about 30-in. spacing was used. Two bolts per joint were put in, the tracks being full spiked and laid to conform to the usual side track standards. Eight and six degree curves were used as a maximum curvature and were put in good running surface. No chances were taken that might result in a derailment and the blocking of any switching lead. No delay from defective track has occurred. Practically all turnouts are No. 9 rigid frogs in all weights. Where possible, turnout material was furnished of the same weight as track being laid, avoiding the necessity for compromise joints. Tie plates and braces were put on track in switches and important curves to permit as safe opera-

tion as would be expected by switchmen in ordinary yards or sidings. A switching crew was assigned to handle track material and worked in between regular switching crews, greatly facilitating the delivery of track material.

The track organization consisted of an assistant roadmaster, one foreman and as many assistant foremen as were needed. The latter were taken out of the gangs. A maximum of 165 men and 30 teams were used in track construction.

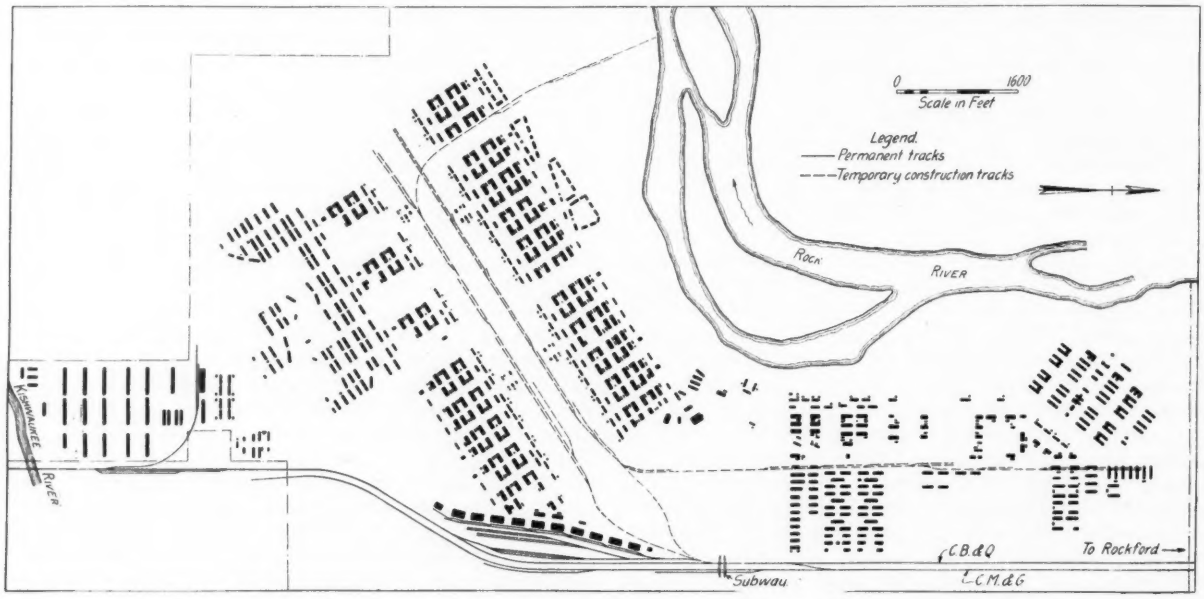
RECORDS

The regulation method of time keeping and time distribution were employed, as organized on Chicago, Burlington & Quincy work, all material being checked into camp by a material clerk. One assistant engineer was assigned to the records of the work, who, with the assistance of a head timekeeper, made an inventory of each track and spur as laid, releasing material in his

the Burlington furnished all other material and furnished all labor and supervision. All ties were furnished from the tie plant at Galesburg.

SUPERVISION

The writer, in close touch with the construction quartermaster, supervising engineer, contractor and consulting architect, anticipated the requirements of the work as far as possible. Close touch with officers in charge of material for the railroad made it possible to follow closely the unfolding of the plan of the government and assemble the material promptly. Major D. H. Sawyer, construction quartermaster, is in charge of construction for the government; C. H. Bennett, city planner, and W. L. Maloney, supervising engineer, directed the construction. Bates & Rogers, represented by E. P. Lenahan, vice-president, are the contractors. F. X. Fisher, assistant engineer, Chicago, Burlington & Quincy, directed engineering for the Burlington, and I. W. Trox-



LAYOUT OF THE TRACKS AND BUILDINGS AT CAMP GRANT

record as taken up. A draftsman platted tracks and, with colors, made a complete log of the entire operation from the beginning. A daily report of labor expended is made to the government field auditor and frequent plats colored to show the existing status of track progress were also furnished. A record will also be made of material shipped out. With a log map, on a scale of 200 ft. to 1 in., and an inventory, it is expected that the information may be furnished later in any form required by the War Department.

The assembling of so much material in so short a time, at a time when there was urgent need for it for industrial work, necessarily drew heavily on the local supply and in fact on the supply available for this purpose on the entire system. Various means were resorted to in keeping Camp Grant supplied. Rail relaying gangs on the main lines were moved on branches to release rail scheduled to come out later in the season. Rail for industrial tracks already graded was diverted. Important yard work at terminals has been seriously delayed. Rail from points in Missouri, Colorado and even Montana was moved to Camp Grant.

The Chicago, Milwaukee & Gary furnished about three miles of 60-lb. rail purchased for the purpose; ell of the Chicago, Milwaukee & Gary rendered assistance at the commencement of the work.

CHRONOLOGY

Track construction began on Sunday, June 24, when a work train left Aurora at 4 a. m. with trackmen and material for 800 ft. of track. A spur was completed at night, on which several cars of contractor's camp outfit were set. No information was available at this time as to the location or amount of temporary track needed. The contractor had seen a rough sketch of the plan and gave a tip that he would want tracks built along an axis, but no location of the line could be given on the ground. A hint that local surveyors were at work on the topography of a part of the cantonment started a search of their office, which was found in a farm house several miles from the track. Fortunately the engineer in charge had some knowledge of the location of the axis and had taken some topography along that line. He was induced to run the line to the track and turn the angle. Thus something of a tangible nature for a location made a start possible on June 26. Temporary track along the south line of the axis with six spurs was rapidly pushed for 8,300 ft. No grading was possible on the early part

of the work. Track was laid on top of the ground and raised later to a better grade. Material arriving for first building construction was set out the minute track reached the first unit on June 30.

On July 7 a second lead on the north side of the axis was commenced and on July 11 the Kiswaukee lead was begun. On July 27, 6.3 miles of temporary track had been completed. A maximum of 165 men and 30 teams were employed on July 21. Nine and seven-tenths miles of temporary track have been laid for construction purposes, and 6.09 miles of permanent track will be laid with the completion of the plan, a total of 15.8 miles of trackage.

It is not possible to give accurate cost data on track work at this time. There is little doubt that it will be high. Labor costs are practically 100 per cent above usual rates. The cost of track laying will be approximately 55 cents per lineal foot and the cost to remove track will run about 13 cents per lineal foot. It also appears that the cost of temporary and permanent track laying will be about the same.

BUILDING THE TRACKS AT CAMP UPTON*

BY COLEMAN KING

Supervisor, Long Island Railroad, Jamaica, N. Y.

One of the 16 cantonments is located on Long Island, 65 miles east of New York City, on the Long Island railroad. It involved the hasty construction of the necessary trackage facilities on the part of the railroad to enable it to handle promptly the contractors' materials and accessories for the construction of the camp buildings, and later the troop trains and necessary provisions for the sustenance of the men.

After numerous changes and modifications of plans the layout finally adopted by the government required the construction of about 11 miles of track, 3¼ of which was to take care of the contractor's materials for the construction of the camp buildings and necessary accessories. The remainder was for the permanent layout, including a wye to facilitate the operation of a passenger yard, an engine yard, a freight yard, a team yard, a wood yard, a coal trestle and large storehouse tracks. This required the assembling of 116,160 ft. of rail, 42 turnouts of various sizes complete and 29,000 ties, together with all the other track fastenings.

At the time the government order for the construction of the camp was finally made formal, the amount of track material actually at our main storage point was negligible and it required thorough combing of the entire road for the necessary material. After all material not in the track was finally picked up it was found that the amount was not sufficient, and a number of small side tracks which had not been in use for some time, and which we do not contemplate using in the very near future, were taken up.

All the new rail on hand, which, unfortunately, was a comparatively small amount, was laid in tracks so as to recover the old rail for this construction. It can readily be seen that in order to pick up this large amount of rail at least one-half dozen different weights and sections were represented. The rail which was most accessible was picked up first, and the future assembling done in order, which necessarily required the use of a large number of compromise joints. Of course, it was impossible to get them in time from the manufacturers, and we therefore put our blacksmiths at work immediately turning out homemade bars as fast as possible.

*Abstracted from a paper presented at the convention of the Roadmasters and Maintenance of Way Association, Chicago, September 19, 1917.

Practically all the rail used was lying alongside the main track, which required the use of an engine and derrick to load it; except where ties, together with small lots of rail, were loaded at various points along the line, all the loading was done by the hand. Two gangs of men, consisting of a foreman and 15 men in each gang, with a work train were employed almost continuously loading small lots of rail and ties and the necessary fastenings.

The ties loaded were those in piles along sections intended for this year's renewals, but 50 per cent of our allotment having been installed, owing to a labor shortage affecting us practically the same as the other railways of the country. Our practice has been to install 70 per cent of our tie allotment in the spring and the balance late in the fall. As far as the ties were concerned we were fortunate inasmuch as we had a great number of oak ties coming in from the South in box cars. The majority of those ties were unloaded at two central points easily accessible to the camp where they were inspected. Those ties were later reloaded on gondola or flat cars by work trains as fast as required for the construction work. Prior to receiving those ties we found it necessary to load some of the renewal ties as mentioned previously.

This construction work started on June 28, first by laying a siding ¾ mile long parallel with the main track to permit the unloading and release of cars of contractors' materials already in transit. Next the laying of the 3¼ miles of contractors' material tracks was started, the main stem of which was 12,700 ft. long with its alinement through the camp grounds so laid out as to place the tracks convenient to the locations of the buildings to be constructed. The right of way was cleared by the contractor's men. Track was laid over the rough ground, no grading being done other than cribbing over short sags. In some instances the track was built on 8 per cent grades for short distances, and was raised later so as to reduce the gradient to 2½ or 3 per cent.

Our organization consisted of six small extra gangs with a daily average of 75 laborers, one team of horses and one work train with a car of rail ahead and two cars of ties next. Dollies were used to skid the rail ahead onto push cars and the team was employed to distribute half the required ties ahead, the remainder being unloaded from cars as movement was made forward and put under the tracks in the rear of the train. The material tracks were laid, surfaced and completed on August 7. At about the same time that the contractor's material tracks were started the grading for the permanent terminal trackage was started. This trackage was to handle the passenger and freight business of the camp with passenger and freight stations located on the camp grounds about one mile from the main track, and required permanent roadway construction. In the construction of this 7¾ miles of tracks, 20,000 cu. yd. of grading was necessary.

The equipment used to do the grading consisted of 1 steam shovel, 2 locomotive cranes, 1 A-frame derrick mounted on a car, 1 spreader car, 1 engine and crew, 20 12-yd. dump cars, two grading foremen and 43 laborers were employed.

The locomotive cranes and a frame derrick also used in handling materials. The necessary right of way clearing was done by railway forces. A road roller was pressed into service as a stump puller. The laying of the track followed closely after the grading.

The labor forces engaged in clearing the right of way, constructing tracks, handling materials and assisting car-

penters on terminal building materials consisted of six extra gang foremen and 110 laborers.

Both the contractors' material tracks and the permanent terminal yard tracks were ballasted with cinders. A total of 369 hopper car loads containing approximately 26,000 yd. were used, all hauled 60 miles from the western terminal. Eighty per cent of the cinders were purchased from New York City industries and delivered to our Long Island City dock on scows. In order to handle the business at the camp properly, in addition to our regular traffic on the portion of single track main line, it was also necessary to increase the length of passing sidings at several points. This necessitated about 7,400 ft. of additional tracks with the necessary rails, ties and track fastenings.

At the camp terminal a passenger station, a freight house, an engine house, a water tank, train and engine men's buildings with eating and sleeping quarters, etc., were constructed. All of our forces with the exception of the carpenters, who had temporary eating and sleeping quarters at the camp, were moved each day in coaches by work trains to and from our Jamaica terminal, a distance of 54 miles, leaving Jamaica at 6 a. m. and taking 1 hr. and 40 min. to make the run one way. Returning, they left the camp at 5:20 p. m. and arrived at Jamaica about 7:45. Straight time was allowed the laborers from the time they left Jamaica until they returned. We could not get labor any other way, as the men would not board at the camp at an increased wage, preferring to go home every night, a majority being married men with families. All of this camp track construction was completed on September 8.

TRACK WORK AT CAMP PIKE, LITTLE ROCK, ARK.

The sites selected for the cantonment in the vicinity of Little Rock, Ark., known as Camp Pike, is on high, rolling ground covered with scrub oak timber. The location is four miles north of and at an elevation of 300 ft. above Dalhoff, Ark., the nearest railroad station, which is three miles north of Little Rock on the Missouri Pacific line between Little Rock and Coffeyville, Kan.

Upon the final selection of this site the railroad was called upon to construct the necessary railroad tracks at the earliest possible date, in order to provide transportation facilities for men and materials to build the camp and have it in condition to receive 30,000 soldiers in September. A time limit of three weeks was set by the railroad for the completion of the tracks up to the cantonment boundary.

The topography of the country between Dalhoff and the site is for the most part rough with steep slopes and no reliable maps were available on which to base the most economical location. Surveys for the tracks outside the cantonment site were started on June 13, 1917, and six preliminary lines, aggregating 16 miles, were run before the final location, which has 2 per cent maximum grades and maximum curves of 10 deg, with 75 per cent tangent, was decided upon. The setting of center stakes for the tracks outside the cantonment was completed on June 26. Surveys for the tracks inside the site were started on June 27, and after running several preliminary lines aggregating about 5 miles, the final locations were selected and approved by John R. Fordyce, major engineer, A. Q. M.

The work outside the cantonment consisted in the construction of 4.1 miles of main track and three passing sidings aggregating 1.2 miles in length. In order to complete these in the time set, a force of 450 laborers and 275 teams was required. These were distributed over the work so that each successive step followed directly upon the one preceding, the locating party being followed closely by the clearers, who were in turn followed by the grubbers, then the graders and finally the track layers. On July 14, three weeks from the date of beginning, this portion of the track work was completed.

The tracks inside the site were, generally speaking, constructed over fairly easy territory and aggregated about 4.1 miles in length with 168 ft. of frame trestle bridging spanning a subway over two driveways and two sidewalks. Work on these tracks was commenced July 15, a force of 200 laborers and 210 teams being employed. The number of teams was gradually reduced until a minimum of 85 was reached.

In addition to these tracks, the railroad was called upon at various times by government officers to do grading and lay temporary tracks for unloading the government general contractor's materials. It was also necessary to construct a spur track 1,100 ft. long from one of the passing sidings to serve the government remount station.

The necessity of obtaining practically the entire force for all of the track work from inexperienced laborers picked up wherever they could be found, and the urgency of the work requiring that it be completed without allowing time to organize the gangs properly resulted in excessive costs, particularly for grading and track laying.

Nearly all the materials except rail and ballast were obtained from the railroad stock at Argenta, Ark., three miles away. The rail was obtained from a supply recently released from main track near Wagoner, Okla., 240 miles north. The gravel for ballast outside the cantonment, amounting to about 13,000 cu. yds., was brought 115 miles from a river plant at Arkansas City, Ark. Ballast for the tracks inside the site, about 8,000 cu. yds., was hauled 45 miles from a river pit at Malvern, Ark.

In order to build the tracks outside the site within the specified time it was necessary to construct portions in a temporary manner; some embankments were too narrow to hold ballast; some rock excavations were not down to grade; borrow pits were undrained; waterways were neglected and only half the ballasting was done. These defects have for the most part been rectified, all borrow pits have been filled up or drained and the right-of-way has been put in a sanitary condition. The total cost of tracks outside the cantonment amounted to about $200,000 and those inside to about $155,000.

We are indebted to E. A. Hadley, chief engineer of the Missouri Pacific, for this information.

THE SECOND LIBERTY LOAN.—A campaign was inaugurated among the employees of the Pennsylvania Railroad on October 9 with an address by President Samuel Rea, delivered at a meeting of about 200 officers of the company. Mr. Rea pledged the support of the road in making the loan a success, and urged full co-operation on the part of all employees. Those in attendance at the meeting were the officers of the company who have been designated to take active charge of the field work of the campaign on all parts of the lines east of Pittsburgh and Erie. Each division, shop and department was represented and general instructions were issued for all. Approximately sixty-five committees will be organized to cover all portions of the road, and altogether upward of 1,000 men will be enlisted in the work of personal solicitation. It is part of the plan to make a personal appeal to each of the 160,000 employees.

SAFETY FOR MAINTENANCE OF WAY MEN

Three Discussions of Problems of This Department By Special Students of Accidents and Their Causes

THE sixth annual safety congress of the National Safety Council was held at the Hotel Astor, New York, on September 11-14, 1917. This association is divided into sections, one of which is devoted to the study of accidents in the steam railroad field. At the meetings of this section several papers were presented which are of special interest to employees in the maintenance of way department. Abstracts of three of these papers appear below.

LIABILITY OF NEW MEN TO ACCIDENTS

By T. H. Carrow

Safety Inspector, Insurance Department, Pennsylvania Railroad

In normal times between 80 and 90 per cent of the employees on the railroads have at least two years' service and the vast majority of these have more experience, indicating that the greater part of the working force is made up of permanent employees. Nevertheless, the number of men hired yearly to take care of the labor turnover on some of the larger railroads, even in dull times, is equal to 30 per cent of the total number in the service, while during the present year some railroads, particularly those located in the munition manufacturing districts, are having a yearly turnover equal to the average number of men making full time. So, after making due allowances for those roads which have a comparatively permanent force, it is assumed that the turnover and the increase in the working forces on all the railroads in the United States at the present time is equal to at least 900,000 men yearly and the actual number may even exceed this figure.

It is impossible to determine the actual number of men now employed in the various departments. It is even more difficult to determine the actual extent of the labor turnover by occupations. However, on the basis of reports made to the Interstate Commerce Commission and the experience of a large railroad an estimate is made as follows:

Occupation	No. in Service	Turnover
Station men, except agents	175,279	171,000
Train service men	329,799	99,000
Shopmen	407,729	180,000
Trackmen	397,053	387,000
All other employees	490,140	63,000
Total	1,800,000	900,000

On some of the larger roads about 33 per cent of the total number of injuries occurring at the present time involve men who have been in the service less than six months, while nearly one-half of these occur to men who have been in the service less than 30 days, the percentage varying in the different departments according to the nature of the work performed.

Maintenance of Way Employees

The most prolific cause of serious accidents among maintenance of way employees is "struck by trains," 68 out of every 100 fatal injuries to trackmen being attributable to this cause. Loading and unloading rails, frogs, timber and other heavy material is always more or less hazardous even to the experienced man, but with the new man it is doubly dangerous and it is also the kind of work the dangers of which no amount of instruction will insure employees warding against. There are also many other kinds of work in the maintenance of way department, such as tamping ties, driving spikes, etc., which are much more hazardous to the man who has had no experience than to those familiar with the work.

The stoppage of immigration during the last three years on account of the war has entirely changed the problem of safety so far as non-English speaking labor is concerned. In August, 1914, there were 33,804 foreign-born employees in the service of the Pennsylvania Railroad, which was 24.5 per cent of the total of all employees in the service; in July, 1917, there were only 25,721, or 16 per cent, of the total in the service. Out of the total of 25,721, 8,003 are naturalized citizens, 3,069 have obtained their first papers and 5,604 have expressed their intention to become naturalized.

The following statement shows the number of foreign-born employees in the service of the Pensylvania Railroad of the principal nationalities:

English	1,833	Polish	263
Irish	2,064	Austro-Hungarian	3,977
Italian	8,425	Mexican	1,370
German	2,069	Swedish	518
Russian	2,186	Greek	496

As it appears that a very large percentage of foreign-born railroad employees are either English-speaking people or have been in this country long enough to acquire a working knowledge of the English language, it follows that the same methods employed to instruct and protect native-born Americans are applicable to the vast majority of foreign-born workers on the railroads of the United States at the present time. However, as a means of educating both the English and non-English-speaking employees, the Pennsylvania Railroad has established free educational courses. At the present time, 1,881 students are enrolled, while 1,515 of those previously enrolled have left the service within the last three years, many of whom have gone back to the old country to enter the war.

HANDLING MATERIALS

J. T. Broderick

Supervisor of Special Bureaus, Baltimore & Ohio, Baltimore, Md.

If the rules of the operating and maintenance of way departments and the safety rules which have been issued on the Baltimore & Ohio, and no doubt on many other lines, for the guidance of employees engaged on track and structure work, were strictly observed, probably 90 per cent of the accidents occurring in the handling of track, bridge and building materials would be averted, but this is a difficult matter to constantly keep this before the men. It, therefore, becomes the duty of the supervising officer to check the men under his direction continually to know that there are no violations of the rules. In other words, the safety problem in the performance of maintenance of way work by railroad employees is summed in the maxim, "Eternal Vigilance is the Price of Safety."

Thorough Inspection Necessary

In preparing for the day's work the foreman should see that an inspection is made of all tools, appliances and hand cars, so that he may have positive knowledge that there are no defects which may result in accidents. This

is especially important with respect to the condition of tools, since many accidents occur because the men do not take time to make a few necessary repairs.

In hiring men the foreman should make special efforts to impress upon them the necessity of carefulness and thoughtfulness while on duty and explain very clearly the dangers and accidents that will result from carelessness. Safety demands this. When it is necessary to employ foreigners, special care should be taken to acquaint them with the provisions of the book of rules and the regulations promulgated for the guidance of employees engaged on or about the track, that they may become thoroughly acquainted with their duties.

LOADING AND UNLOADING RAILS

The principal cause of inquiry in the handling of track, bridge, building and other maintenance or construction material is the improper handling of heavy structural material, such as rail, ties and timber. One of the most frequent causes of injury is found in careless or dangerous methods of handling rails. This is true from the time the rail leaves the mill until it is placed in the track. Many of the rail mills now load heavy rails by magnet cranes, thereby avoiding the risk that is involved in loading by hand or moving from skids into the cars. This same method (that is, use of magnet cranes) should be followed in loading or unloading rails where they are stored in large quantities. Where rail is stored in small quantities and a crane is not available, it should be placed on skids in single layers so as to avoid unnecessary handling.

In unloading rail for distribution along the track, a small crane, or, preferably, an air hoist unloader, should be used. Such a device is not only safe, but also economical, and is, therefore, doubly justified. However, even with the use of such an unloading device, there are frequent injuries to the men in separating the rails in the car and attaching the hoist. This is especially true where rail is loaded indiscriminately into the cars or nested in close tiers. In order to avoid this the rail should be loaded head up in tiers, with timber strips between each tier. From a safety standpoint such a method of loading is almost ideal.

In handling rail on the ground, rail tongs should be used and rail should not be picked up without tongs if it is possible to avoid doing so. Where labor is scarce when rail is being laid and a sufficient number of experienced men cannot be obtained to pick up rails safely, the use of one of the several types of rail-laying machines may be advisable. These machines generally embody some form of hoisting device, mounted on a push car, and may be handled by a very small gang.

INSPECT HOISTS AND TRAIN MEN CAREFULLY

When air-operated rail hoists are used, the foreman should see that all working parts are in proper order, that the cables and rail tongs are inspected, and that the stay chains extending from the corner of the car to the boom are properly adjusted and secured. It is necessary that the men employed with rail hoists be organized in gangs, so that each man shall know exactly what is expected of him. The men handling rail should not be addressed in a hasty or boisterous manner as this has a tendency to excite the more sensitive ones and is likely to cause them to do things that they would not do under ordinary circumstances.

When it is necessary to load rails on to cars by hand it is desirable that the gang be divided equally at the ends of the rail. No attempt should be made to throw the rail unless an ample force is at hand to throw it clear. One member of the gang should be specifically designated to call directions and no attempt should be made to load when men cannot get away quickly in event of the rail falling back. It is also deemed essential, in the interest of safety, that the loading of material be discontinued while trains or cars are passing on adjoining tracks.

HANDLING TIES

While the handling of ties does not cause so large a number of injuries as rail, yet special effort must be made to insure safety. When being piled for loading or in storage yards, ties should be placed in medium size and uniform piles, according to some approved plan. This will add not only to the stability of the pile, but also insure safe and economical handling to cars. At large store yards or at tie treating plants, the use of a locomotive crane is justified for the handling of ties, since it is safer and more economical.

When ties are unloaded for renewal, they should be distributed and piled in comparatively small lots, say from three to five ties. They can be lined up uniformly at some fixed distance from the track, thereby avoiding the danger of men stumbling over them. In renewing ties the use of tie tongs, where available, is advisable, both from a safety and an efficiency standpoint. This is especially true in the case of treated ties. With such ties the creosote or other treatment material is likely to poison the hands of the men handling them and in every case the men should be cautioned to use gloves.

FROGS, SWITCHES AND CROSSINGS

Other classes of track material presenting difficulties and dangers in handling are frogs, switches and crossings, and, to some extent, ballast. Frog and switch material should be handled in much the same manner as rail, and in loading or unloading, cranes or hoists should be used. For heavy and complicated crossing work it is often advisable to place these units directly in position with a locomotive or wrecking crane.

About the only chance of injury in the handling of ballast is in the unloading and distribution along the track. Where this is done from ordinary cars, such as hoppers or hopper-bottom gondolas, considerable difficulty is sometimes experienced in getting the material to run out properly, and it is not unusual to have cars derailed or to have the men in the cars injured. For these reasons it is advisable to use special designs of cars for this purpose. There are several such types, mostly of patented design, which unload and spread the ballast as desired and at any practicable speed.

The foreman should exercise particular care in the unloading of material along the right of way, so placing it as to avoid the possibility of its fouling the track, and to see that his men do not pile ballast so high in the center of the track that it will come in contact with the pilot or with other parts of locomotives or cars. Aside from the danger of causing a serious train accident the material is likely to be thrown with sufficient force to injure persons near by.

In general, in the handling of almost of any track material, the small monorail cars of the type generally known as pony cars are very useful. They will carry heavy loads, can be handled by one or two men, and may be quickly unloaded and lifted from the rail.

HANDLING BRIDGE MATERIAL

In handling bridge material, especially in maintenance work, the use of such cars as just mentioned is advisable. This is especially true in handling timbers on and off a structure. In such work material is generally lifted or lowered to place by means of rope and tackle and,

provided these are of proper quality and the men using them are sufficiently experienced, little or no improvement could be suggested in the method of handling. In placing bridge ties, however, the use of the tie tongs of a two-man type is recommended as being safer and more expeditious than rope.

In loading heavy ties or timber of large dimension from storage yards it is advisable, wherever possible, to use flat cars or drop-end gondolas. This will avoid the necessity of lifting the timber over the high sides of a car if a crane or other device is not available. The storage yards themselves should be equipped with derricks or locomotive cranes to handle the timber. By concentrating storage at a few principal points, the use of such devices can generally be made an economic as well as a safety feature.

Heavy steel work and structural members are generally of necessity handled by cranes, derricks or travelers. On some smaller jobs, however, considerable manual handling is often done, but it is nearly always possible to obtain the use of a wrecking or other crane for such work. Plate girder or I-beam spans and slabs should be unloaded from cars in this manner and it is generally best to use a crane in placing them in position or in position for rolling.

ERECTING BUILDINGS

In erecting buildings the foregoing remarks also apply to heavy timber and steel members. In handling brick, terra cotta or similar material, where the building is carried to a height of several stories, an elevator should be provided rather than to have the material carried up ladders. Such material as is stored on the ground should be piled in a neat and stable manner, both as a measure of protection to the material itself and to prevent injuries to the workmen.

Of miscellaneous materials which require special treatment mention may be made of inflammable and explosive substances. Gasoline, oil, etc., should be kept for distribution at some central point where a properly designed store house may be built. Only comparatively small quantities should be kept at outlying points and then only in tight and well-designed tanks kept underground or isolated.

Explosives, such as blasting powder or dynamite, are often necessary in case of slides or for removing dangerous obstructions or overhanging rocks. In territories where the use of explosives is frequent enough to justify keeping a quantity on hand, a concrete storage house should be provided at some isolated point. Under no circumstances should it be kept in section houses, freight houses, etc.

OPERATION OF HAND AND MOTOR CARS

By S. G. Watkins

General Secretary, Central Safety Committee, Boston & Maine, Boston, Mass.

The hand and motor car have been a fruitful source of accidents to the trackmen. These accidents usually occur from three causes: Improper equipment, improper loading or improper handling. Nearly all are traceable to failure of the human element.

EQUIPMENT

I will mention two cases of faulty equipment: In the hand car I have found that the breaking of the handle or lever was causing many serious accidents. Many times poor material was used in making these levers, and the foreman never thought of replacing one until it broke. On our road I contended for an iron handle instead of wood, but it met with so much opposition by those in position to know more about it than I, that the idea was abandoned. However, the situation was improved, I think I may say was made satisfactory, by ordering first-class hickory and constructing these handles in our shops; also instructing our section foremen to test these handles frequently, and have a new handle applied before the old one should break and cause an accident.

I think that no motor car is properly equipped unless it has a rail eighteen inches high across the front end of the car to prevent men from falling off, because many serious accidents have occurred from this cause.

IMPROPER LOADING

If more attention could be paid to the proper loading of hand and motor cars, accidents from this source might be eliminated. I recall a very serious accident where a cattle guard, a supply of tools, and eight men were loaded into a motor car when an iron bar fell from the car and derailed it. It is hard to realize that in these enlightened days of safety first an accident of this kind could occur. I have many times observed men sitting on the front end of a motor car with their feet hanging down, and have known serious accidents to occur because, in case of a quick stop, a derailment, or a collision, the men in such position were entirely helpless. There was nothing for them to do but fall from the car and be run over. It is certainly a case of improper loading.

Great care should be exercised in loading at all times, especially when the motor car is in use. Tools should be not only properly placed, but they should be secured in such a manner as to make it impossible for them to fall from the car when in motion. There seems to be a tendency to overload the motor car. This is doubly dangerous when it is overloaded with men, and great care should be used to have men properly and securely seated before the car is started, always having in mind the possibility of a quick stop or a collision.

IMPROPER HANDLING

Speed seems to be the menace of the motor car. It appears to be hard for the man in control to realize that he is going 30, or even 40, miles an hour instead of 20. I believe the remedy is simple and effective. Strengthen the human element by education. I would teach the foreman that it is not enough that the men under his charge should know their danger, but that it is incumbent upon him that they avoid it. Any foreman will worry if he loses a hand car. I would have every foreman educated to the fact that it is a thousand times worse to lose a man. I would convince him that it is not economy to run into danger when a few minutes' delay would insure safety, and that speed purchased at the price of safety is always dearly bought. I would educate the dispatcher and operator to show a little more consideration for the trackman and to realize that his work is as important as any, and that his life and limb are as precious. We should all bear in mind that it is difficult for a foreman, with two or three men, to operate a hand car and flag himself around curves, and that the men in these positions are sometimes entitled to a little more consideration than they are getting.

I have found one means of education which seems to be effective. Occasionally I make a list of all accidents to trackmen which have occurred on our system within a certain period, omitting the names and places, but telling just how each accident occurred. This information is sent to the supervisor, who in turn sends the lists to the track foremen. In this way the individual is brought to realize how many accidents are really happening.

The Banquet on Wednesday Evening.

THE BRIDGE AND BUILDING CONVENTION

Abstract of Committee Reports, Papers and Discussions at the Twenty-seventh Annual Meeting—A Large Attendance

THE twenty-seventh annual convention of the American Railway Bridge and Building Association was held at the Hotel Sherman, Chicago, on October 16 to 18, inclusive. The meeting was unusually successful from every standpoint. The number of members present excxeeded the record established at the New Orleans convention last year, over 165 registering, while the attendance at the various sessions was larger than ever before. The discussions were also more active and it was necessary in almost all cases to close them before the subjects had been exhausted in order to adhere to the schedule.

The time of the convention was devoted primarily to the consideration of those problems which are of special concern to the men in this branch of railway service at the present time, the program having been revised radically by the executive committee at a meeting in August to enable this to be done.

The officers for the past year were: President, C. E. Smith, consulting engineer, St. Louis, Mo.; first vice-president, E. B. Ashby, consulting engineer, Lehigh Valley, New York City; second vice-president, S. C. Tanner, master carpenter, Baltimore & Ohio, Baltimore, Md.; third vice-president, Lee Jutton, division engineer, Chicago & North Western, Madison, Wis.; fourth vice-president, F. E. Weise, chief clerk, engineering department, Chicago, Milwaukee & St. Paul, Chicago; secretary-treasurer, C. A. Lichty, general inspector, purchasing department, Chicago & North Western, Chicago.

The convention was called to order by President Smith at ten o'clock Tuesday morning. Addresses of welcome and other formalities of this character were dispensed with to conserve time. In calling the convention to order, President Smith referred briefly to the unusual conditions now confronting the men in this branch of railway service and to the necessity for a thorough interchange of ideas at the present time. He then called for the first report.

ECONOMICAL DELIVERY OF WATER TO LOCOMOTIVES

COMMITTEE REPORT

Water is delivered to the tender of a locomotive either directly from a storage tank or through a pipe line and a discharging device, commonly called a water column, standpipe or penstock. In the early days of railroading water was delivered direct to the engine tenders from the pumps, which were chiefly operated by hand by switchmen or other employees when not engaged in other duties. Later horsepower was employed and in time storage tanks of small capacity were constructed and water was delivered to locomotives through leather hose or boots, as they were then called. Metallic and rubber tank fixtures followed and finally the sway spout and tank valve came into use. Many different types of spouts and fixtures were evolved, none of which can be said to give entire satisfaction, even to the most improved tank fixtures of to-day.

The earlier types of tank spouts were fitted with ball joints and also with rubber hose connections. These fixtures were a continual source of annoyance and expense, especially in the colder climates where they gave much trouble from freezing. Spouts of more simple form were then devised, the spout being considerably larger than the goose neck or outlet pipe, which permitted

a more liberal water passage and overcame the necessity for a water-tight joint between the outlet pipe and the spout. This type of spout was also more simple in construction and repairs than the close fitting joint and is still in general use with but little modification in design.

Penstocks or water columns have taken the place of tank spouts to a large extent in modern installations of railway water stations, largely because they permit a more convenient location of the tank and also the taking of water at several points. The desirable qualifications in a penstock are a rapid delivery of water with low frictional resistance to the flow, and a valve movement that may be handled and controlled easily without water hammer. The construction of the penstock should be such as to permit it to be operated easily and to be economical in maintenance. The importance of the time element in train service requires that the delivery of water to the tender be made as quickly as possible. For this reason the waterways should be of ample size and the flow of water through the column as direct as possible. The following paragraph on the discharging capacity of penstocks is taken from University of Illinois Bulletin No. 21:

"It would seem that with a short line of pipe from the supply tank a velocity through the water column of 12 or 15 ft. per second may be considered as the maximum desirable for ordinary conditions, and for longer lines the limiting velocity should be smaller. For a long line of supply main the limit of allowable velocity would be perhaps as low as 8 ft. per second. It would seem, then, that 3,000 gal. per min. for an 8-in. water column, 4,000 gal. per min. for a 10-in. water column and 6,000 gal. per min. for a 12-in. water column may perhaps be considered to be the limit of desirable flow through water columns. It would also appear that a loss of much more than 20 ft. of head for the discharges just mentioned may be considered to be excessive, under conditions of ordinary tank supply."

C. E. SMITH
President of the American Railway Bridge and Building Association.

The principal advantages in the use of penstocks or standpipes are that they permit the selection of a permanent location for a tank remote from the tracks and out of the way of future construction, and that they make it possible to deliver the water to locomotives from a single storage tank at as many different points as may be desired. Other advantages are that they do not obstruct the view of signals, etc., they offer better drainage and thereby cause less trouble from soft track and ice in winter, they are less liable to strike trainmen and cars than a spout suspended over the track and they may be protected from freezing more readily than the gooseneck and valves of a tank.

The earlier penstocks were of the rigid-spout type, which permitted a radial movement only, the delivery of water being controlled by a gate or globe valve. The necessity of a flexible connection was soon appreciated and the spout connection was made with a flexible connection to the upper elbow. As with the earlier type of tank spout the manufacturers of penstocks endeavored to maintain a water-tight joint at the upper elbow and at the same time provide a vertical as well as a radial movement of the spout. However, the maintenance of this joint was difficult and expensive, and in 1904 what was known as the Fenner drop spout was put on the market. This consisted of a spout with the upper elbow telescoping into the end of the spout far enough to prevent any water splashing out of the opening. The open joint of this spout not only gives a great range of adjustment, but prevents ice from forming in the joint. This form of spout is provided with practically all modern makes of penstocks and is a decided improvement over the rigid spout, as it has a wide range of adjustment in a perpendicular line with the discharge end always in the center of the track and a lateral movement according to the length of the spout. It can be swung out or in, increasing or decreasing the length of the spout to reach the center of the track in the event that the penstock is located between diverging tracks or tracks at different distances from the penstock and avoids the necessity for spotting the engine accurately when taking water. Another advantage in the telescopic spout is that it lessens the liability of the penstock being knocked down, owing to its greater flexibility, and in this way reduces the maintenance cost.

It is important that supply lines leading to penstocks be designed properly. A penstock operating under a low head should have a larger pipe than one working under a relatively high head. The same thing is true of a long pipe line. If the maximum delivery is desired the supply line should be at least two inches larger than the penstock. Where several penstocks are installed in a busy yard or where more than one engine will take water at the same time, the supply line should be large enough to supply water to more than one penstock without any material decrease in the delivery. A 12-in. penstock with a 14-in. main 1,000 ft. long will deliver 4,000 gal. per min. with approximately the same loss of head as a 10-in. penstock with 1,000 ft. of 12-in. main delivering 2,750 gal. per min. or an 8-in. penstock with 1,000 ft. of 10-in. main delivering 1,750 gal. per min.

A distance of 20 ft. from the top of the rail to the bottom of the tank is generally accepted as the economical height of tower for tanks. A higher tower is not economical on account of the increased cost of raising the water to the greater elevation, while a lower tower does not furnish sufficient head for the larger engines with high tenders. It is also essential that the tank itself should be within narrow ranges of elevation, to avoid any considerable variation in pressure, as a balanced valve such as used on modern penstocks operates most satisfactorily under a uniform head.

The proper location of penstocks is an important factor in the economical delivery of water. At engine terminals they should be located conveniently so that an engine may take water along with other supplies, such as coal, sand, etc., without any switching or back-up movement. Penstocks serving yard engines should be so located that they will not interfere with the movements of road engines handling trains or with the movements of engines to and from the roundhouse. In a large yard it is important that the engines do not block the switching lead when taking water, the proper location of penstocks being at each end of the yard, where engines may take water after receiving their trains. In a large yard this may mean a heavy expense for pipe lines, but where there is a frequent train movement the expenditure will be justified by cutting down the terminal delay and facilitating the movement of trains. Where the distance from the main supply tank is very great, as for example at an isolated penstock at the far end of a station or yard layout, it will frequently prove more economical to locate an auxiliary tank opposite the penstock, as the supply would be taken by gravity from the main tank through a much smaller pipe than if the engines were supplied direct from the main tank through a penstock main. This is especially true with the present high cost of cast-iron pipe. For example, the cost of laying a 14-in. main will be nearly double that of an 8-in. main, and the difference in cost of 2,000 ft. of pipe will more than pay for a 100,000-gal. wood tank. Where water is pumped by company forces the additional storage will frequently dispense with the services of a night pumper and guard against delays on account of breakdowns.

An important feature in the economical delivery of water to locomotives is the prevention of waste while taking water. This is sometimes due to carelessness on the part of the fireman, but more often is the result of faulty fixtures and improper design of the manhole on the engine tank. The great range in the height of manholes above the rail makes it a very difficult matter to provide fixtures that may be adjusted to the varying heights unless the manhole is of liberal size. This is especially true of tank spouts. The manhole should be rectangular in shape and not less than 16 in. wide and 30 in. long. It will be found that when taking water with a spout without lateral adjustment, the spout will be at the outside edge of the manhole on high tenders and near the inside edge on low tenders. Thus it will be seen that it is impossible to avoid a waste of water with round manholes unless they are of uniform height above the rail.

S. C. TANNER
Vice-President.

C. R. Knowles, superintendent of water service, I. C., Chicago; L. A. Cowsert, supervisor of water service, C. N. O. & T. P., Danville, Ky.; H. A. Horning, superintendent of buildings, M. C., Jackson, Mich.; M. D. Miller, contractor, Chicago; R. C. Henderson, master carpenter, C. H. & D., Dayton, O., Committee.

DISCUSSION

The discussion of this report was confined almost entirely to the relative merits of telescopic and rigid spouts. B. F. Pickering (B. & M.) stated that he has found the cost of maintenance of telescopic spouts so high as to make them uneconomical and that he has replaced a number of them with rigid spouts. The high cost of maintenance was the result of rough handling which it has been impossible to eliminate. He stated that this trouble was not caused by carelessness in spotting the engines, as all freight engines were required to be cut off from their trains before taking water. Passenger engines are not spotted so accurately, with the result that with telescopic spouts the water overflows onto the track and creates trouble in the winter. In a reply to a question he stated that no rigid stand pipes had been broken. G. W. Andrews (B. & O.) defended the telescopic spout because of its more satisfactory service from an operating standpoint. There was a wide difference of opinion among other members, some favoring each type of spout. S. C. Bowers (P. L. W.) stated that 60 rigid stand pipes are in service on the Pittsburgh division of the Pennsylvania Lines and that they are giving no trouble in spite of the fact that engines are not required to cut off from their trains before taking water. However, all engines are provided with large tank openings.

LEE JUTTON
Vice-President.

ERECTION OF GIRDERS WITH LITTLE INTERRUPTION TO TRAFFIC

COMMITTEE REPORT.

It has often been said that the product of railroads is transportation. The bridge department must keep this fundamental principle in mind at all times in carrying out its work. All bridge work must be planned to interrupt traffic as little as possible, remembering that, when trains are stopped on account of a bridge not being ready, a portion of the plant is shut down and the output is stopped until the trains are allowed to proceed. In some cases there is traffic both on and under a bridge which may be under construction. This occurs when a railroad crosses over another railroad, a navigable stream, a busy street or a highway. The problem of maintaining two sources of traffic is often met with in the construction of railroad bridges, and, of course, is more difficult than that of maintaining traffic only over the bridge.

In the erection of railroad bridges under traffic, one of two general methods must be selected for each particular case. The old bridge must be taken out in small portions and the new bridge erected in the same manner, or the old bridge must be taken out and the new one put in by handling one entire span in one operation. The first method is almost always selected when the traffic over the bridge is quite heavy, making it impracticable to suspend traffic long enough to permit the taking out

of an entire span. There are times, however, when this method cannot be followed even in the case of large structures and on heavy traffic lines. In such cases falsework cannot be put in for the erection of bridges in sections and some method must be found to put in one entire span at one operation. When bridges are erected by putting in a portion of a span at a time it is necessary to provide a rather large amount of falsework and to arrange this falsework so that the work of changing from the old bridge to the new can be stopped at any point in order to let trains over when they reach the bridge.

In arranging falsework of this kind it is generally desirable to have the bents in two sections. The lower section should be constructed so as to support a system of sub-stringers. These should be low enough to clear the lower chords of both the old and the new bridges. The upper section should be constructed so as to be inside of the trusses or girders and to carry the track during the removal of the old bridge and the erection of the new.

The method of putting in bridges by changing out one entire span at a time is usually selected when traffic conditions are not severe. It has the great advantage of requiring little or no falsework. As has been mentioned above, however, this method must be used, no matter what the traffic conditions are, when it is impossible to put in falsework, such as over busy navigable streams or railroads. Almost always the new span is assembled and riveted alongside the span it is to replace. This necessitates the erection of one falsework bent at the end of each pier and abutment to receive the new span in its temporary position. This is usually put on the down-stream side; although if local conditions require it may be put on the up-stream side. Almost always the ties and rails are put on the new span in its temporary position so as to avoid doing that work after the span is moved into its permanent position. Before the new span is moved it is, of course, necessary to dispose of the old span. If time will permit, the best method is to cut the old span apart and lift it out with a derrick car. If, however, time will not permit, falsework bents must be erected on the opposite side of the piers and abutments from the new span so that the old span can be moved out to one side preliminary to the moving in of the new span.

F. E. WEISE
Vice-President.

If the weight of the new span and the capacity of the derrick wil permit, the new span should be assembled on the ground at the end of the bridge and then carried bodily into place. The old span, of course, can be removed in the same way. When conditions will permit this method of erection no falsework of any kind is needed.

When, though, truss spans are replaced with deck-plate girder spans, it is almost always possible to set the girder spans inside of the truss spans by cutting down the masonry and removing the lower laterals and the floor system of the truss spans. Under proper conditions the girders can be lowered with rigging suspended from the top chords of the old trusses. This is a very economical method of erection, but it can be used only on lines where the traffic is comparatively light.

Committee: Lee Jutton (Chairman), division engineer, C. & N. W., Madison, Wis.; C. W. Wright, master carpenter, L. I., Jamaica, N. Y.; J. S. Huntoon, chief bridge inspector, M. C., Detroit, Mich.; J. G. Bock, general bridge inspector, C. St. P. M. & O., St. Paul, Minn.; C. U. Smith, assistant engineer, C. M. & St. P., Milwaukee, Wis.; S. T. Corey, chief draftsman, C. R. I. & P., Chicago, Ill.

DISCUSSION

The discussion of this report was confined principally to descriptions of methods which different members had used to replace spans without interfering with traffic any more than necessary. R. H. Reid (N. Y. C.), J. S. Huntoon (M. C.), G. W. Andrews (B. & O.), and others described instances in which work of this character has been handled successfully under adverse conditions.

REPAIRING AND STRENGTHENING MASONRY

COMMITTEE REPORT.

The committee, through its chairman, W. F. Strouse (B. & O.), submitted a progress report on this subject, based upon nine replies to a circular letter and asked that the committee be continued for another year. The questions contained in the circuiar letter related to the pointing or grouting of stone masonry originally laid dry, the time at which such work should be done and the methods by which it was accomplished. Information was also asked concerning methods adopted to strengthen masonry which was showing signs of failure. In the replies received a wide difference of opinion was expressed regarding the advantages gained from the pointing of masonry laid dry, a number of the roads disproving such work except where it was desired to improve the appearance. The grouting of masonry was more generally advocated. Various methods were advocated to strengthen masonry that was showing sign of failure, depending upon local conditions. The report contained a large amount of detailed information concerning the manner in which specific problems were solved.

DISCUSSION

C. E. Smith stated that about 10 years ago there were over 150 bridges on the Missouri Pacific system under which piers and abutments were moving. In many instances they were disintegrating and required repairing and strengthening. Longitudinal stringers were placed under the bridge seats in a number of cases where the piers were cracking, while in some cases one or two courses of masonry were removed and concrete caps placed. Where these measures were taken and the pressure distributed the foundation was able to carry the load in every instance. A number of piers were also encased successfully, the new concrete adhering to the old and stopping further movement, although placed while the old piers were vibrating under traffic. Every structure of this character was strengthened in place without failure.

PAINT AND ITS APPLICATION TO RAILWAY STRUCTURES

COMMITTEE REPORT.

From the standpoint of present-day construction the problem of painting may be considered under four heads: Wooden or frame structures, brick and stone structures, steel and steel-covered structures, and concrete and

stucco structures. Occasionally we may find any combination of the above. From the railway standpoint, these structures may be separated into station and office buildings, dwellings, tool and car houses, shop buildings, coaling and fuel stations, etc.

Wooden and Frame Structures.

This class entails the greatest amount of attention and expense, for the only practical method to protect them from decay or to improve their appearance is to apply a preservative coating of high-grade paint. Unpainted wood will darken, warp, become fuzzy and damp and finally decay, but it may be protected permanently from these effects through the occasional use of high-grade paints. Paint acts as a preservative on wood because it closes the openings and pores and so prevents the entrance of decay-producing organisms.

The quality and kind of lumber used in the different structures varies, of course, with the different sections of the country, being governed principally by the type and kind grown in the sections traversed by the particular railroad. The woods generally used for siding, outside trim, etc., are usually of the softer classes, such as white pine (although this supply is rapidly diminishing), hard or yellow pine, poplar, basswood, Oregon cedar, redwood, cypress and spruce.

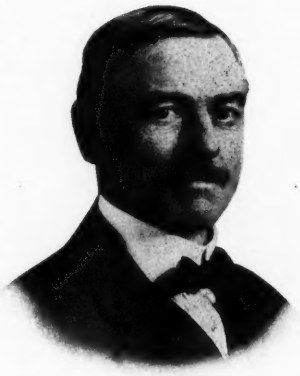
These different species and types of woods vary greatly in their makeup, porosity and compactness, all serious points when the initial or priming coat of paint is applied. White pine and poplar, being soft, close and straight-grained woods, comparatively free from shrinkage, possess good absorbing qualities and a ready affinity for paint, while yellow pine and hemlock are hard, coarse-grained, of very resinous and uneven structure, varying from a soft, porous and quick-absorbing, to a very hard and fast surface into which paint cannot penetrate. Thus we can readily see that a mixture of proper consistency and balance for the one, can and will not produce the same result in the other, if used under identical conditions.

The first class requires that the priming coat be reduced to a medium thin consistency, carrying very little turpentine. The second demands a thinner mixture, carrying from 25 to 40 per cent of turpentine. In the first instance successful two-coat work can be obtained, while in the latter case two-coat work cannot be recommended, as thin coats are absolutely necessary to insure depth of penetration or binding. Three thin coats well brushed out will not leave an excess of paint on the surface, while two coats, which would necessarily have to be heavy to hide or cover the surface evenly, may break away or scale in a short time. If for any reason the two-coat work is desired, the liberal use of turpentine in the priming coat is recommended, as well as ample drying time between coats. The priming coat should be applied with a full brush, and spread out well and evenly. The brush should not be allowed to slip over the hard places, but the paint must be worked well into them.

Nearly every railroad has adopted a certain standard of painting, both as to method and colors, including the formulas composing the different mixtures. These mixtures, called "standard colors," are usually bought in the open market, although some roads have paint-mixing departments of their own. In a great many cases this material is brought ready for application, thus leaving no room for adjustment to fit the different surfaces, and, of course, is applied as received. Or on the other hand, incompetent or inexperienced men, who neither know nor care what they are doing, are applying the material in any old way. Such a condition is generally found on railways where carpenters and bridgemen who are unfamiliar with such work take care of the painting.

Priming.

The act of priming or first-coating is the most important operation in painting, although in many cases it is not so considered, which is a vital mistake. The priming coat must fill and satisfy the surface, and so create a foundation upon which all future coats can be successfully applied. It must carry sufficient linseed oil not only to satisfy the surface, but must also bind and hold the pigments to this surface. Priming mixtures must also carry the proper amount of turpentine to cause penetration and assist in forcing the oil and pigment into the surface by absorption. The formation of the pigment must be such as to allow of penetration into the surface, and, above all, must be well and evenly spread and brushed into the surface.



C. A. Lichty
Secretary-Treasurer.

In priming soft wood the paint should be applied with a full brush and enough paint used at all times to satisfy the surface. It should be well brushed. On hard or close-grained wood a medium full brush should be used in application, for this class of wood does not possess the absorbing properties of the softer kind, and therefore requires more brushing. If the priming coat is of the proper consistency, carrying sufficient pigment to fill and hide the grain, and is well brushed into the grain of the wood, most of the absorption will have ceased with this coat, and no excess of pigment is left on the surface. This thin coat then will allow the next coat to bind itself to the wood and combine with the priming coat.

An excess of paint on very porous woods will cause peeling or chipping, for this heavy coating prevents the oils from penetrating the wood and then fails to assist in holding the coat on the surface. The oil and binder in the second coat penetrates into this heavy coating only and does not reach clear through into the wood to assist in forming one solid film well anchored to the surface.

Paint heavily applied to a hard or close-grained surface will dry with a gloss, into which the second coat cannot penetrate to any depth. The prime coat should not stand longer than is necessary to harden the film thoroughly and allow for full absorption and penetration. If allowed to weather, it will become porous and absorb the life of the second coat and there will not be sufficient binder left to adhere to the surface properly.

Finish Coats.

Usually, railway standards and specifications provide whether two or three coat work is desired, but it should be borne in mind that in trying to finish in two coats over dark, hard and pitchy lumber, especially with light shades, success at some future time may be sacrificed. In the second and finishing coating of structures, care must be exercised in spreading the paint evenly and clean and avoid sags and curtains.

Brushing.

The proper care and knowledge in brushing is as necessary as good paint for successful work, for on the working or brushing of the coat rests to a great extent the success of the material used, regarding wear and durability in its protection of the surface to which it is applied. It is a fact that the best material, in the preparation of which great care has been exercised, will not give good results if it is improperly applied. Paint loosely applied to the surface, will not bind to it, neither will it dry nor harden properly, and a coat of paint not properly bound to the surface will be found hard and dry on the outside and unevenly hardened throughout. In conclusion, it is clear that the right kind of mechanics should be employed, for practical experience embodies the proper skill and knowledge, so necessary to success.

Other Structures.

Shingle roofs, at least on the better class of buildings, ought to be painted with some high-grade material, not only to preserve the roof, but to improve the appearance of the structure as well. Moreover, a valuable characteristic of high-grade paint is its resistance to fire. While the oil content is more or less combustible, there is present in the dried paint film a minor proportion of oil, the major portion consisting of metallic and mineral pigments which are unaffected by fire. The content of pigment varies from about 50 to 70 per cent.

On brick and stone structures, with the exception of window and door frames, sash, doors, gutters and down spouts, no painting is really necessary. The method and color for these items is generally the standard in vogue on each system. If for some reason it is desired to paint the brick or stonework the usual rules will govern the operation.

On steel and steel-covered structures, the primer or first coat must be judiciously selected. If the standard finishing color for these structures is of a carbon or lampblack base, it would be positively wrong to use such a paint for the ground coat applied directly upon the steel. This primer should be a properly prepared rust inhibitive coating, from basic pigments, such as red lead, sublimed blue lead, oxide, chromates or the like inhibitive materials. Over such a ground after proper drying time has elapsed, carbon or other standard paints may be successfully applied. Practical tests have proven that ultimate economy is effected by using only the highest grade of the proper kinds of paint for metal protection.

Cement and stucco structures are of more recent origin than the others, and it may be some time before paint will be extensively used on them, but at some time this type of railroad structures will receive attention, to a greater or lesser degree, by the application of paint. The committee wishes to quote Henry A. Gardner, who has conducted tests along this line:

"Portland cement is used for numberless types of construction from concrete factory to the stucco dwelling. Its strength and durability are, however, offset by its unpleasing appearance, especially during stormy weather, when it absorbs large quantities of water and becomes mottled and streaked. At such time the interiors of concrete buildings are apt to become damp and cold. The rough exterior surfaces will receive and retain particles of dust and soot deposit from the air.

"When paint is applied to a concrete structure and exterior pores are filled and a smooth, rubber-like film results that prevents the admittance of rain. This alone should constitute sufficient reason for painting cement structures in every locality. The dust-resisting properties and ornamental character of painted cement should be the further consideration wherever there is civic pride.

"Fortunately, paint will wear upon cement for as great, or even greater periods than upon wood or iron, provided the paint is applied when the cement is dry. Moreover, the same paints that give good service on wood may be used successfully upon cement."

From tests and experiments made for a number of years, it appears that the high-grade composition linseed oil paints, with lead, zinc and inert bases, are giving excellent results on concrete; that being the case, practically the same rules as given for the other types could govern here with but few minor changes.

Chas. Ettinger, master painter, Illinois Central, Chairman.

Discussion

In reply to a question regarding the advisability of heating paint to secure a more thorough penetration, the chairman stated that this practice tended to remove the oils which are the life of the paint. In reply to another question the chairman stated that the service required of paint was more severe along a railway than elsewhere because of the presence of soot and acids in the smoke. G. M. Hoffman (P. & R.) stated that it was the practice on his road to wash every building thoroughly before painting it and then in most cases to give it only one coat of paint. This was done every two, three or four years according to the location and condition of the structure.

FIREPROOFING ROOFS OF WOODEN BUILDINGS

Committee Report.

This subject will be considered only with reference to the fire-resisting qualities of various solutions, coating and coverings which have properties capable of withstanding fire coming in contact from without. Tile and other cumbersome materials not suitable for wooden buildings will not be considered.

Wooden shingles were almost universally used in the earlier days of railroads for the covering of all ordinary buildings having roofs with a pitch greater than one-fourth, and while they are rapidly losing favor, there are certain localities where they will be used for some time to come owing to their moderate cost, light weight, low heat conductivity, wide application and durability. When shingles get old they become a considerable fire risk and are set on fire readily by sparks from passing locomotives. While there are a number of preparations on the market to make them fire-resisting to a considerable degree, they are likely to be neglected beyond the length of time the preparation remains effective and in this way the roof again becomes a fire risk.

From the book entitled "Fire Prevention and Fire Protection," by Freitag, pages 838 and 839, we quote in part: "So-called fireproof paints or cold water compounds which are sold under a variety of trade names, all claiming fire-resisting properties, should be classed as fire-retardents rather than as fireproof. While wood or other combustible materials which have been coated with such compounds will withstand the blasts of a match successfully, a few minutes' exposure to a greater heat, as of a lamp, will show that no great degree of fire-resistance exists. However, the preventive value of such coatings is material, especially for scenery properties and other stage fittings, that the quick spread or 'flash' of fire over such materials will be greatly retarded, if not prevented altogether. The use of fire-retarding paints or solutions

is, therefore, to be strongly recommended for scenery etc., whether required by law or not."

Believing that it was the intention that this report should give more consideration to coverings which are to replace the wooden shingle, we will proceed in that direction.

Coverings prepared by saturating felt with asphalt, sometimes termed "composition roofings," or "prepared roofings," are sufficiently fire-resisting for all practical purposes, and on buildings which have a pitch of one-fourth or greater, and where appearance need not be taken into consideration, such material laid from rolls in large sheets with 2-in. lap joints may answer the purpose as well as anything. These ready roofings are also put up in the form of shingles, which, if properly laid, make a very good appearance and will last from 6 to 15 years, depending on the quality of the materials used in their composition. The trouble with ready roofings is that when the oil dries out of the asphalt the felt becomes dry and brittle and the life of the covering is at its end. Most wooden buildings with flat roofs or roofs with slight pitch are best covered with tar and gravel or metal roofs, the former being generally used on main buildings, and tin in sheets on porch roofs and other places where tar and gravel would be objectionable for any reason.

Shingles made from a composition of cement, asbestos, etc., having various trade names are used to a considerable extent and they present a good appearance. These have not been in extensive use long enough to determine how long they will last, but up to the present time they seem to be a good substitute for slate and are not so easily broken. They have been in general use only from 5 to 10 years.

Slate shingles have been in use many years, and for roofs having more than a moderate pitch they are perhaps as durable as anything on the market, or much more so. In cold climates where the pitch of a slate roof is less than one-third or one-fourth, slate often proves troublesome, as where heat from beneath melts snow which has lodged on the roof it holds the water in suspension while it finds its way under the slate by capillary attraction, and if freezing occurs before the water runs off it invariably breaks the slate in great numbers. This will cause a leaky roof, or the roof may leak under these conditions without the slate being broken if the felt undercovering does not give the required protection. This melting and freezing condition is quite common where the roof continues from a warm building to broad eaves or sheds where it is cold underneath, and more especially if there is a break in the pitch of the roof at the eaves.

Tin shingles are used to a considerable extent on some roads and give good satisfaction. When secured with the "bar lock" it is impossible for a tin roof to leak during its lifetime. These shingle are manufactured in various ornamental styles and make a neater appearance than any other kind of ordinary metal covering. Their life on railroad buildings depends entirely on the kind of metal and its protective coatings—tin, galvanizing, paint, etc.

Galvanized iron, laid in sheets, with seams running vertically, has been used to a considerable extent and will last a long time if painted about every three years, but it does not present as good an appearance as ornamental tin shingles. These metal coverings are not nearly as durable as they were when wrought iron and old-style tin were used. Tin or galvanized iron with soldered seams is often used on flat roofs and will last a long time if properly and consistently protected with paint.

The ordinary tar-and-gravel roof is probably more extensively used on roofs having a slight pitch than any other kind of covering, and its wearing qualities are so well known as to require little comment. Its life depends solely upon the quality of the materials used and their application.

Roof coverings which require protective coatings are at a decided disadvantage, for the reason that they are liable to be neglected beyond the time when the coating remains effective when the covering suffers and may result in premature loss.

C. A. Lichty, inspector, purchasing department, C. & N. W., Chicago; J. B. Gaut, superintendent, bridges and buildings, G. T., Chicago; A. T. Hawk, architect, C. R. I. & P., Chicago; J. W. Miller, architect, C. & N. W., Chicago; P. Aagaard, chief inspector, I. C., Chicago, Committee.

Discussion

Hermann Von Schrenk, consulting timber engineer, St. Louis, described the results which have been secured from an investigation of methods of making timber fire-resistant, extending over a period of 10 years. He also presented an extensive exhibit of sample roof sections and of timber and other roofing materials which have been subjected to fire tests. He stated that in co-operation with the paint manufacturers association a paint has been developed which is fire-resistant. P. J. O'Neill (N. Y. C.) stated that the practice of painting shingle roofs had been abandoned on his line as the paint was found to form small dams at the lower ends of the shingles, which retained water and promoted early decay. Several members testified to the fact that the painting of shingles prevented warping.

CONCRETE CASING FOR STEEL STRUCTURES

By E. E. R. Tratman,
Western Editor, Engineering News-Record, Chicago

The practice of applying a concrete casing to girders, viaducts and other steel structures has been adopted on a considerable scale, and is on the increase. It is employed for three reasons, more or less in combination: (1) to protect the steel against atmospheric destructive influences; (2) to protect it against the destructive effects of the hot gases and cinder blast of locomotives; and (3) to improve the appearance of the structure.

The casing may be applied in two ways. It may be ordinary concrete placed in forms as in usual practice, or it may be a cement-sand concrete blown upon the steel by pressure. This latter method may be operated either by compressed air or by steam. Steel reinforcement is required in either case, with special attachments to bond the concrete to the steel. Longitudinal rods are generally used, with wire mesh over flat surfaces and projecting flanges, and around small members. Sometimes cross rods or anchors are put through the girder webs. According to a report from the Kansas City Terminal railway, in the 1916 "Proceedings" of the Association, the cost per square foot is about 25 cents for concrete placed in forms, and 23 cents for "gunite" placed by compressed air and the cement gun. These prices include concrete, reinforcement and labor.

When ordinary concrete is used a relatively thick mass must be applied. There is doubt sometimes as to the close adhesion of the concrete to the steel, and as to the protection against moisture which may be absorbed by the concrete and thus come into contact with the steel. On the other hand, this method permits the formation

of panels, molding, etc., to relieve the surface and give an effect of architectural treatment. A rich mix with small size coarse aggregate is required, the mix being very generally 1:2:4.

Gunite differs from ordinary concrete in having no coarse aggregate, as the material has to be applied with a hose. It is usually about a 1:3 mix. This material has the special advantage of high density, with small absorption of moisture, and close adhesion to the steel.

Concrete casing of steel bridge work has been employed in several cases on track elevation work in Chicago. A prominent example is the skew bridge carrying the Rock Island across the Chicago & Western Indiana at Seventy-ninth street. There are five plate girder through spans of 85 to 90 ft., with plate girder floorbeams resting in the bottom chord, and having their tops enclosed in the reinforced concrete deck slab. Beneath the deck is a 5-in. slab at the level of the chords of the girders, protecting the steel from the blast of locomotives passing under the bridge. Steel bars are run through holes in the stiffeners, and wire mesh is laid over the chords, webs, gussets to floor beams, etc. The concrete coating was applied by the cement gun. It is 1¾ in. thick on the girder webs, gussets and other flat surfaces, 2 in. under the floor beams, and 3 in. on the chords of the girders.

Poured concrete was used for the bridges on the track elevation of the New York, Chicago & St. Louis from Seventy-third to Seventy-ninth streets, Chicago. The Seventy-fifth street bridge is a typical example. This has two 25-ft. roadway spans and two 10½ ft. sidewalk spans, with through plate girders and a floor of transverse I-beams embedded in a concrete slab with reinforcing of steel rods and wire mesh. The posts of the bents are composed of two channels and an I-beam, and are connected by diagonal braces of four angles with web lacing. The casing of the girder decks forms one solid mass. That of the bents gives finished rectangular sections. The concrete is a 1:2:4 mix, using 1-in. stone, and is at least 1½ in. thick over all steel. The estimated cost of the concrete casing is as follows (1912 prices):

Concrete, 180 cu. yd.	at	$10.00	$1800
Wire mesh, No. 23, 2550 sq. ft.	at	1.98 per 100	51
Wire mesh, No. 74, 4850 sq. ft.	at	.58 per 100	28
Wire, No. 14, 63 lb.	at	1.35 per 100	1
Rods, 2370 lb.	at	.025 per lb	59
			1939
Allowance 15 per cent			291
Total			$2230

On the long-span girder bridge carrying this work over the Illinois Central the concrete floor is shaped to form jack arches between the webs of I-beams, the lower flanges being heavily encased. The columns and the transverse trusses between them are cased in concrete, but the girders are not so cased above the floor level.

Concrete casing promises certain advantages in reducing the amount and cost of inspection and maintenance of steel structures. As an example of this, one road reports that repainting steel bridges averages 60 cents per ton per year, while there has been no maintenance cost as yet, and no cracks or defects have appeared on concrete casing done a few years ago. Concrete has also an advantage as a mechanical protection, affording additional resistance to the attacks of gases, acids and cinder blast.

Two points are essential for permanent success: The concrete must have close adhesion to the steel, so that moisture cannot get between the steel and the concrete, and the concrete must be dense so that moisture cannot work through it to the steel. Remember that the steel cannot be painted if it is to be encased with concrete, as that would impair the adhesion. Therefore, if moisture can get through or around the concrete it finds the steel bare and exposed to attack.

SECURING AND HOLDING MEN

No formal report was presented on this subject, but letters were read from three members outlining their views on this important topic and describing methods which they are employing to enable them to retain adequate forces. In the discussion of this subject B. F. Pickering (B. & M.) emphasized the importance of the reputations which roads, camps and foremen acquire among the laborers and dwelt upon the asset which a favorable reputation is in the maintenance of adequate forces. He described the difficulty in securing men cooks for bridge gangs during the past summer because of the higher wages offered by contractors and by the government, and stated that he solved this difficulty by employing a married man and his wife, in each gang, the men working as a laborer and the wife as cook. His experience has been that this is more satisfactory than the employment of men cooks.

HOUSING AND FEEDING CREWS

F. E. Weise, chief clerk, engineering department, Chicago, Milwaukee & St. Paul, Chicago, presented a paper on this subject in which he described in detail the facilities which should be provided in order to house and feed laborers properly. This paper was an amplification of two articles by Mr. Weise which were published in the *Railway Maintenance Engineer* for July and August.

DISCUSSION

A. Montzheimer (E. J. & E.) stated that cars used for housing men on his roads have been provided with steel underframes to increase the safety of the gangs while being transferred from one place to another in trains, as he believed this more safe than depending on the placing of cars at the rear of trains. J. E. Toohey (P. M.) described the difficulty of keeping bedding in camps clean and stated that he has arranged for it to be washed in a concrete mixer at regular intervals. A. S. Markley (C. & E. I.) and others advocated allowing men to leave the work early Saturday afternoon if necessary to enable them to go home over Sunday and to avoid spending two nights on trains. J. P. Wood (P. M.) emphasized the importance of allowing the men to go home as frequently as the work permitted, but opposed the establishment of any set period, believing that the frequency of these trips should depend upon the character of the work and the location of the crews relative to their homes.

UNIFORM VERSUS DIFFERENTIAL RATES OF PAY

BY E. T. HOWSON,

Editor, *Railway Maintenance Engineer*, Chicago, Ill.

The bridge and building department, in common with other branches of the maintenance of way department, is experiencing serious difficulty at present in retaining adequate forces. The competition for men has become unusually keen, particularly since July 1 of this year, when the construction of the cantonments and other concentration of camps for military forces called for large numbers of carpenters and other skilled mechanics at wages far above those which the railroads were paying.

However, in spite of its present acuteness, this problem is not entirely a recent one, but it has been developing for many years. The present abnormal conditions are only revealing more prominently the fact that at each recurring period of prosperity the railroads lose their men to other industries, which indicates that they are not meeting the competition of other employers successfully. Primarily, this is a question of wages and this fact leads to a consideration of the present basis of wage rates on the railroads.

The principle upon which wages in the maintenance of way department are based is that of a flat or uniform rate for every man. This in turn presupposes that all men are worth equal amounts or that they are of equal ability and efficiency. It is primarily because of this foundation that difficulty has arisen in retaining forces, for when a man realizes that increased experience and greater effort are not rewarded, he either reduces his pace to that of the rest of the gang or, if ambitious, goes to another industry where his efforts are more adequately rewarded. In either case, the company loses the benefit of his greater exertion.

Furthermore, the railways have not kept pace in the last few years with the rapid increase in the wages of skilled workmen in other industries. In many cases it has been considered impractical to raise the wages of the large numbers of men employed because of the expense involved, while in others the disinclination to disturb relations with the wages of other employees has tended to hold all of them stationary. The result has been that the outside industries have been able, through their higher wages, to attract the best men, leaving the less efficient to the roads.

All of these conditions have acted to the detriment of the bridge and building department and have affected the efficiency of the forces adversely. In view of the present almost universal shortage of men, it is, therefore, particularly important at present to consider ways in which this tendency can be arrested.

One suggestion which has been made to meet this condition is that of establishing different rates for the men in the gangs, which rates could be so arranged that while the total payroll for the gang would not be increased, the men would be paid in proportion to their experience. In other words, instead of paying a flat rate of perhaps 30 cents per hour for all men in a gang, good, bad and indifferent, experienced and inexperienced, a few men might be paid 35 or 40 cents per hour, others less experienced, 30 cents, and the remainder of the gang would be composed of ordinary laborers, who would be paid the prevailing laborers' rate of perhaps 25 cents. In this way it would be possible to retain a nucleus of efficient men in each gang, as their wages would compare favorably with those in competing industries. These men should set the pace for the entire gang, including the laborers, who should be little, if any, less efficient than the inexperienced men now composing the larger part of the forces in nearly every gang. A graduated rate can also be held out to the newer men in the gang as a reward for experience and as an incentive for them to put forth their best efforts. In other words, the tendency of such a plan is to hold both the inexperienced and the experienced men, a thing much to be desired.

One objection to this system which has very largely retarded its adoption is the fact that the establishment of a higher rate for one group of men disturbs relations with other groups. Regardless of the merits of the contention of any group of employees, the raising of their rates enables other groups to argue that their work is as important, relatively, and that they are also entitled to increased pay, and it is very difficult to refute such arguments.

An even more serious objection to the differential rate is the tendency of some foremen, and not a few supervisors, to use such a differential as a means of securing righer wages for as many of their men as possible without regard to their merit or the purpose of the differential. If this plan is administered in such a way the only result is to increase the payroll without securing a corresponding return and the plan defeats itself.

In spite of these handicaps, a differential wage rate adjusted to the merits of the different classes of employees has much to commend it, particularly at the present time when labor is so scarce and so nomadic. If fairly and intelligently administered it will benefit a road by enabling it to meet the competition of industries to a greater extent than is now possible, while it holds out the promise of reward to the younger and less experienced but ambitious workmen.

This is not an untried theory, for at least one road; the St. Louis-San Francisco adopted the plan of paying differential rates for its bridge, building, painting and concrete forces over a year ago, with excellent results. The most experienced carpenters and painters are now paid 35 cents per hour. A second rate of 30 cents per hour is paid for less efficient men, while general handy men are paid 27½ cents and laborers from 15 cents to 25 cents, depending upon the locality. These rates have enabled the road to secure and hold a much better class of men than formerly, and as a result more work has been done by this force this year than in any similar period in the history of the road. The officers in charge of this branch of maintenance work stated that if this plan had not been in effect much of this work, now completed, would have had to have been left undone because of lack of forces. The statement is further made that this plan has been shown to be economical to the road. Others should find the results equally favorable.

As an instance of the manner in which the men regard this method of payment, the Frisco sent a gang of 50 men to Fort Sill this summer where the government was hiring every man it could at rates almost twice those being paid by the road. In spite of this fact, the road did not lose a single man from the gang, although it contained some of the best carpenters in its employ.

Discussion

In opening the discussion of this paper President Smith advocated the more general adoption of a sliding or differential wage scale, pointing out the experience on the street railways where rates of pay increase automatically with length of service. F. L. Burrell (C. & N. W.) advocated a sliding scale, stating that he had employed it successfully on his division for 6 or 7 years. G. W. Andrews (B. & O.) stated that the differential rate was adopted on the B. & O. 15 years ago and that it has worked very satisfactorily. Some difficulty was experienced at first in counteracting the tendency of foremen to employ men at the higher rates and the number of men at these higher rates in each gang was limited at first, although authority has been secured from time to time to increase this number. J. B. Sheldon (N. Y. N. H. & H.) and B. F. Pickering (B. & M.) advocated the plan as being founded on sound business principles. Mr. Pickering stated that he has developed many of his best men from those without experience and that while the adoption of a sliding scale of wages places more responsibility on the supervisors it offers an incentive to

men to do their best. He advocated the payment of higher wages to men solely on the basis of their efficiency without consideration of the length of service.

CONDITIONS IN THE MATERIAL MARKET

The session on Wednesday afternon was devoted to a consideration of the bridge and building material problem. The first paper dealt with conditions in the structural steel market and was presented by Albert Reichmann, division engineer, American Bridge Company, Chicago. In this paper Mr. Reichmann pointed out the necessity of this country providing a large amount of the steel required by the Allies in the conduct of the war. He stated that the maximum production of steel in the United States of 31,300,000 gross tons in 1913 had been increased to 42,773,680 gross tons in 1916 and that in the latter year this country produced approximately 50 per cent of the entire steel production of the world. Of the total production of steel in the United States, structural steel, consisting of steel bars, shapes and plates, constituted about 12,400,000 tons. According to a New York financial paper it is expected that the government will require about 7,400,000 tons, leaving about 5,000,000 tons for other uses. Mr. Reichmann then described the priority regulations and their application to steel work for railways, and concluded with the statement that after a careful consideration of the steel problem, both as to production as well as the apparent government requirements, it would appear that there will be sufficient tonnage remaining for ordinary construction purposes with a reasonable time for deliveries.

The present material situation with reference to timber was presented by Hermann Von Schrenk, consulting timber engineer, Southern Pine Association, St. Louis, and W. F. M. Goss, consulting timber engineer, West Coast Lumber Manufacturers Association. Mr. Von Schrenk referred to the heavy demands for dimension timber for the construction of the cantonments and similar government activities. He also stated that in the last two weeks the government has commandeered all 12-in. by 12-in. yellow pine timber 30 ft. long and larger sizes for wooden ship construction. He stated that the priority regulations also applied to timber, but that he believed all the material actually needed for the railways can be secured. However, he urged the careful conservation of new timber and the reuse of second-hand timber to reduce the demand as far as possible. Mr. Goss described the trouble with strikes on the western coast which at one time reduced the output to 35 per cent of capacity, but stated that production has now been raised to 75 per cent. He described several attempts which the labor agitators had made to cripple the output of spruce used in aeroplane construction, and stated that the government has now commandeered practically all of the mills cutting spruce.

THE PRESENT SITUATION AS TO WATER SERVICE MATERIALS

By C. R. Knowles,
Superintendent Water Service, Illinois Central.

Although a very conservative estimate of the increased cost of all materials used in maintenance of way work has been given as 30 per cent, I think we can safely say that with few exceptions, this figure will come nearer representing the minimum increase in the cost of waterworks materials, many items having increased several hundred per cent. The unprecedented prices and the uncertainty of delivery have created conditions which make it very necessary to employ methods that will help to conserve materials used in waterworks construction and maintenance, especially with such materials as are particularly difficult to secure.

From the present outlook some relief appears in sight as regards prices of certain materials, the price of cast-iron pipe having dropped $15 per ton on October 1; although with the government and foreign requirements, in addition to the greatly increased domestic demands for materials of all kinds, we cannot hope for much relief in the near future, as far as deliveries are concerned.

The Attendance on Tuesday Morning

While all materials have advanced in cost, the increase has been more marked in iron and steel products, and articles manufactured from brass, copper and other semi-precious metals. Boilers have doubled in cost with indefinite dates of delivery on those built to specifications. Steel tanks of all kinds have advanced from 100 to 150 per cent, tank hoops from 75 to 100 per cent, steam pumps from 40 to 50 per cent and oil engines 30 to 40 per cent, with deliveries from 3 to 9 months in the future, depending on the size of the units.

All stocks of steel and wrought-iron pipe have been depleted and it is difficult to even get a quotation on a definite date of delivery on large pipe. The following table indicates the approximate prices prevailing on steel and genuine wrought-iron pipe from 1914 to date:

	Steel Pipe	G. W. I. Pipe
January, 1914	$ 43.00 per ton	$ 55.00 per ton
July, 1914	42.00 per ton	54.50 per ton
January, 1915	43.00 per ton	55.00 per ton
July, 1915	44.00 per ton	55.50 per ton
January, 1916	47.00 per ton	59.00 per ton
July, 1916	68.00 per ton	85.00 per ton
January, 1917	82.40 per ton	103.00 per ton
July, 1917	114.40 per ton	143.00 per ton
October 1, 1917	114.40 per ton	143.00 per ton

The above prices apply to base sizes, that is, ¾ in. to 3-in. b. w. steel and ¾ in. to 1½ in. b. w. genuine wrought iron. It is impossible to prepare a table on larger pipe that would indicate even an approximate price, as all quotations have been based on delivery and stocks on hand. To illustrate the scarcity of large

wrought-iron pipe, one of the largest oil well supply houses in the country has pulled well casing from the ground that has been in use for 19 years and paid the owner of the wells 20 per cent more for the pipe than was paid for it when new 19 years ago. The pipe was then sold for double its original cost.

Delivery on cast-iron pipe has been fairly good, although the price has more than trebled in two years. We are laying cast-iron pipe today that ranges in cost from $18.50 to $60 per ton, while the lead used in making the joints has advanced from $3.75 to $11 in two years.

The following table shows the range in cost of cast-iron pipe from 1912 to date.

Year	1912	Approximately	$20.65 per net ton
Year	1913	Approximately	20.35 per net ton
Year	1914	Approximately	18.50 per net ton
Year	1915	Approximately	18.60 per net ton
Year	1916	Approximately	25.00 per net ton
January,	1917	Approximately	32.75 per net ton
July,	1917	Approximately	49.30 per net ton
October 1,	1917	Approximately	60.00 per net ton

In justice to the cast-iron pipe manufacturers, it may be said that the increase in the cost of pipe has been more gradual than the advance in iron. This may be explained by the fact that the cast-iron pipe manufacturers had some iron bought ahead and only advanced prices as the old contracts expired.

There are many reasons for the difficulty in securing material and delay to shipments, the chief reason being on account of the enormous amount of material going to foreign fields and taking precedence over orders for materials for domestic use. The shortage of labor and labor troubles have also had a serious effect on the delivery of materials and we cannot look for much, if any, improvement for the duration of the war.

It is along the line of salvaging old pipe lines that the greatest good may be accomplished in conserving waterworks materials. The salvage of cast-iron pipe is almost 100 per cent. Except for the cost of removal, a cast-iron line is of as much value when taken out of the ground after years of service as when it was laid. It is true that a year ago, with cast-iron pipe at $18 per ton, the cost of removal would in many cases have almost equaled the cost of new pipe, but with pipe at $60 per ton the removal of old lines is a paying proposition. In many instances wrought-iron pipe may also be salvaged to good advantage. For example, 600 ft. of 5-in. genuine wrought-iron pipe laid at Hampton, Miss., on the Yazoo & Mississippi Valley, was removed recently at a cost of less than 10 per cent of the value of the pipe. This pipe was in excellent condition, notwithstanding the fact that it was laid 30 years ago.

The saving effected by the conservation and salvage of second-hand material is not confined to pipe alone, but includes all classes of materials. Tank hoops may be repaired and used on other tanks. Sound staves and bottom plank may be utilized in the construction of smaller tubs; valves and fittings may be repaired at a small cost and made to answer for new; rubber pump valves may be faced off and used again; pump packing, worn too small for one pump, may be used in a pump requiring smaller packing. In fact, with present price conditions, there are but few items that will not justify the spending of considerable time and effort in their conservation.

In many cases standards may be revised, substituting material expensive and difficult to secure with that less expensive and more easily obtained. For example, we have changed the design of our water-column pit, eliminating about 3,000 lb. of castings and several hundred pounds of reinforcing bars, and I believe we now have a better designed pit than we had before. The difficulty in securing steel plates and the great increase in the cost of steel tanks have forced many railroads which had practically adopted the steel tank as standard to return to wood. The high price of steel has also stimulated the interest in concrete tanks and there is great activity along this line. The high cost of cast and wrought-iron pipe has caused many roads to give serious consideration to substituting wood stave for iron pipe.

A great deal may be accomplished in conserving materials by overhauling scrap piles and reclaiming second-hand material, also by cleaning out shelves and the pump houses of the ever-present accumulation of globe valves, fittings, etc., held for a fancied emergency that never occurs. Scrap has advanced in price to such an extent that in some instances the scrap value of an article is in excess of its cost new a few years ago, consequently scrap should be kept cleaned up and forwarded promptly to the storehouse in order that it may be disposed of to the best advantage.

It has been truly said that "The ways in which material and supplies are wasted on a railroad are as many as the number of persons in its employ," and if we may learn the lesson of economy in the use of materials from the present situation it will not have been without its good effect.

DISCUSSION

Following the presentation of the papers on the material situation they were discussed together. I. L. Simmons (C. R. I. & P.) thought that concrete will be the solution of the present shortage of structural steel. He also urged that more attention be given to means of carrying bridges over by strengthening them rather than replacing them with heavier structures. He has frequently found it possible to strengthen bridges at relatively small expense and with results as satisfactory as would have been secured from new structures. C. E. Smith described the manner in which the Texas & Pacific bridge crossing the Trinity river at Dallas was strengthened last year to carry heavier power. Other members reported similar practices. Mr. Smith deprecated the loss of piling which is necessary to replace because of rot at the ground line, and urged the conservation of this material by preservative coatings, boxes of salt, concrete jackets or other expedients. Hermann Von Schrenk described some experiments which are now being conducted on a road in Louisiana in which boxes of salt have been placed immediately under the caps of Southern pine piling. This salt is exposed to the weather and some of it runs down over the piling during each storm, retreating the timber.

CONSERVING MATERIAL

C. A. Lichty presented a verbal report on the conservation of materials by intelligent reclamation, pointing out the opportunities for saving and at the same time emphasizing the tendency of overdoing this work. G. W. Andrews (B. & O.) described in some detail practices which have been developed extensively on that road. A large number of bridges are being reclaimed at the maintenance of way shops at Martinsburg, W. Va., by cutting them up with the oxy-acetylene torch and then rebuilding them for use at other points. Also saws are now being installed in the reclamation plant at Baltimore, where bridge stringers, caps and other large timbers will be sawed into crossing planks, etc. It is expected that the timber reclaimed at this point will almost meet the demands for this class of timber. He

also stated that until a few years ago it was the practice for the different divisions to scrap all of their water service pumps, but that this was changed, and all pumps are now sent to the maintenance of way shops at Martinsburg for repairs. As a result it has not been necessary to buy a single steam pump during the last five years.

CONSERVING CARS IN COMPANY SERVICE

J. R. Pickering, superintendent of car service, Rock Island Lines, Chicago, prepared a paper on the shipping of company materials in such a way as to best conserve the car supply. In this paper he pointed out the fact that the railroads cannot expect the public to conserve the car supply of the nation and to secure their fullest co-operation without first showing the public that they will take the lead in matters of this kind. The possibilities of loading cars in company material service more heavily, of loading and unloading them promptly, and of ordering supplies in such a way as to permit the store department to ship in full car loads, were emphasized. In the discussion of this subject, P. J. Wood (P. M.) stated that an additional man has been employed on his road to see that cars are unloaded promptly. He emphasized the importance of each supervisor giving this subject his personal attention, as foremen become lax otherwise.

ORGANIZATION AND OPERATION OF BRIDGE AND BUILDING MATERIAL YARDS

By H. C. Pearce
General Purchasing Agent, Seaboard Air Line

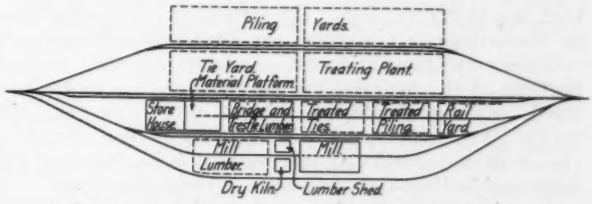
The location of bridge and building material yards must be governed very largely by the geographical location of the property. In the southeast it has been an open question in the past whether it was either economical or necessary to have large general distributing bridge and building yards. Most of the larger systems in the southeast have a large number of mill operations on their own lines, particularly in Georgia and Florida, and lumber has been cheap. Under these conditions arrangements can be made with certain mills to take care of certain territories. By carrying out the budget plan of work and by close supervision and inspection, bridge and building lumber can be moved promptly to the structures where it is to be used and save the cost of operating a general distributing yard and back hauls. This plan, however, leaves many loose ends, and incurs many concealed losses. It is not, and never will be, entirely satisfactory, but the direct saving is so considerable that it must be considered under certain conditions.

On the Pacific Coast a large portion of the lumber comes by water. This makes it desirable that the material yards be located sufficiently close to the docks and wharves to use switching service. Lumber can be taken from the ships, inspected, segregated and loaded on cars directly from ships' tackle, by placing carriers between sling loads, and switched to the yard and unloaded by cranes direct to the piles with practically no more expense than what it ordinarily costs to unload and pile from cars in the yards. In the middle west, the location of lumber yards depends largely on the location of the timber treating plants and distributing territory, so that, broadly speaking, the location of the lumber yard must be left entirely to the geographical location of the property, taking into consideration the source of supply and the location of the timber treating plants.

Laying Out of Yards

In laying out bridge and building material yards, the first consideration must be sufficient space and trackage. I have found double tracks to be the most economical. They require less space and ensure a more concentrated organization, switching facilities, and the use of cranes. Where sufficient water is available an excellent plan is to boom the piling. Piling can be sorted and classified in this way on carriages or retorts, or loaded directly on the cars. This plan offers many advantages.

Piling, stringers and other trestle timbers should be unloaded on tracks adjacent to each other so that a train of cars can be set in and as many feet of trestle timbers as required, loaded in the quickest possible time. Cranes should, of course, be used wherever obtainable in



Suggested Layout for a Material Yard

handling heavy timbers and piling. I have found steam locomotive cranes the most useful for all general service, because they take the place of a yard switching engine, although I can fully appreciate that there are many places where gantry cranes can be used more economically and expeditiously. However, for all general purposes a steam locomotive crane will be found most practical.

The ideal bridge and building yard would include a timber treating plant, planing and wood-working mill, assembling yard, rail yard, frog and switch shop and a general store, for the reason that it is desired wherever possible to load everything out complete in one shipment or shipments from a central distributing point. Appreciating that in only very few cases would it be possible to have the ideal location and the facilities referred to in one place, we will take the position that it is necessary that a bridge and building material yard should include the tie and timber treating plant, a well equipped wood-working and planing mill, a material platform and storehouse.

The ideal bridge and building material yard should be so arranged that all the material, from the piling to the bolts and washers, will be loaded and shipped in the same train. Frequently a certain number of feet of track, as well as a certain number of trestle timbers, is required. The organization should be such that the necessary rail, fastenings, frogs, switches, etc., can be loaded and shipped along in the same manner.

Organization

Maintenance officers have criticized our supply departments for failure to provide material in an intelligent and prompt manner, and very properly so. The reasons are many, but the principal one is that all supply officers do not understand the importance of assembling their materials so they can be shipped in the order they are needed. I have heard the statement made frequently, and no doubt it is true, that about the first thing to reach a structure is the roof. This, of course, is absurd, and has greatly discredited the generally excellently organized and efficient work of our supply officers.

Having prepared his plans and received authority to

do certain work, the maintenance officer then concentrates his efforts toward getting it done. Under a proper organization, he should immediately prepare his requisitions for the necessary material to do the work describing and classifying them properly. By that I mean consolidating the foundation material, superstructure, mill-work, hardware, etc. These requisitions, when properly approved, are forwarded, with all the necessary data such as blueprints and sketches when necessary, to the storekeeper, who arranges immediately to assemble all the material for this work. For this purpose he should have sufficient storehouse and platform facilities for assembling such portions of the material required as must be assembled and held together. Foundation material must, of course, be ordered first. This in most cases will go direct. Mill-work must be ordered or manufactured in the mill. Hardware must be assembled, boxed and marked. The lumber requirements must be checked up carefully and any item short provided.

Unless the requisition states specifically that certain portions of the material for the structure are to go forward, nothing should be shipped until everything is ready. The storekeeper will then notify the officer in charge of the work that the material is ready for shipment and will go forward on a certain date—later advising him the car numbers and the date forwarded, and sending him a detail memorandum invoice covering the shipment. All of the material should be charged direct to the job when shipped. When the work is completed, whatever is left over should be picked up, shipped back and proper credit allowed to the work order. It may be said that this is an ideal only, but this plan has been in effect on the Southern Pacific Company's Pacific system for ten years, and no doubt it is in use on many other railways.

PERSONNEL

The personnel necessary to handle an efficiently organized bridge and building material ward may be said to consist of a foreman in direct charge, with as many working foremen as may be necessary, and the forces divided into gangs of about five men each. It may be said that the foreman should be a practical bridge and building man, and this would appear to be a reasonable conclusion, but the best material yard foremen that I have ever developed were from clerks. What is needed for the operation of a general material yard is a man who is primarily a systematic organizer; a man who is always studying to do things a little better and a little cheaper than before; a man who is not only interested in the material which he is handling, but in the systematic working of the organization.

This leads me up to the question as to what department should maintain and operate bridge and building material yards. I have stated that I know of no sound reason why this work should not be handled by the supply department. My reasons are that the providing, distributing and accounting for materials has become a highly specialized service. It is now generally recognized that the work of buying, providing and distributing materials should not be divided, and that the supply department should have charge of and be responsible for all unapplied materials. Such a department must be properly organized and have a sufficient, well trained force to do the work in the most expeditious and economical manner. The handling of bridge and building materials offers no more complications than the handling of the other supplies on a railroad, and, in many ways, not so much. The same general organization is required, and the same general procedure must be gone through, both as regards buying, shipping and accounting, as well as the responsibility for supply.

It will be said that the storekeeper or purchasing agent does not know what is wanted—that he does not buy or provide the right thing. In many cases this is true, but the conclusion is based on the wrong assumption. It is the duty of our technical officers to prepare the specifications and make the inspections. Our maintenance and technical officers should be required to incorporate all of their experience and technical knowledge in the specifications, and the inspectors should be required to follow these specifications.

The supply department is the providing department. It is the duty of supply officers to so systematize their organizations that they will know absolutely before a purchase is made that it is necessary; that the proper materials have been specified; that the requisitions are prepared in such a manner as to procure the broadest competition; to so arrange their materials when received and to so organize their forces that they can be accurately inventoried, loaded, shipped and delivered where they are required in the shortest possible time, and to see that the salvage is returned, sorted, classified, reclaimed and disposed of to the best advantage, or, in other words, it is the duty of the supply department to follow the material from the time it is ordered until the salvage is disposed of. Unless the supply department is organized first on the basis of giving proper and immediate service, it can never be economical or efficient, and can never hope to accomplish the real purpose for which it was organized, which is the providing of suitable materials when and where they are wanted, at the time they are wanted, and at the lowest net cost. For these reasons I reiterate that there is no sound reason why our supply departments should not organize and operate our bridge and building material yards in co-operation with our maintenance officers.

DISCUSSION

The recommendation in this paper that the handling of materials be placed in charge of the stores department created active discussion and showed the friction which exists between the stores and the maintenance of way department on many roads. A number of members described instances in which work had been held up until it became necessary to transfer gangs to other points because of the delay in the receipt of materials, increasing the cost of the work materially. Several members criticised the tendency of the stores department to reduce stocks to the point that they were unable to fill requisitions promptly. They resented the unfairness of showing savings resulting from decreased stock which in turn increased the cost of work in the field because of delays to gangs, which latter figure it is difficult to estimate with any degree of accuracy.

CLOSING BUSINESS

ELECTION OF OFFICERS

At the closing session on Thursday morning the following officers were elected for the ensuing year: President, S. C. Tanner, master carpenter, Baltimore & Ohio, Baltimore, Md.; first vice-president, Lee Jutton, division engineer, Chicago & North Western, Madison, Wis.; second vice-president, F. E. Weise, chief clerk engineering department, Chicago, Milwaukee & St. Paul, Chicago; third vice-president, W. F. Strouse, assistant engineer, Baltimore & Ohio, Baltimore, Md.; fourth vice-president, C. R. Knowles, superintendent water service, Illinois Central, Chicago. Members of executive committee, A. B. McVay, supervisor bridges and build-

ings, Louisville & Nashville, Evansville, Ind.; J. H. Johnston, superintendent bridges and buildings, Grand Trunk, Montreal, Que.

New York was selected as the location for the next convention with the understanding that the executive committee would have authority to change this should conditions arise which would make such action desirable.

TENTATIVE LIST OF SUBJECTS

At the closing session of the convention on Thursday morning, the Committee on Subjects suggested the following topics for consideration at the next convention with the recommendation that the Executive Committee be authorized to revise this list as conditions arising during the year might justify:

Repairing and strengthening old masonry
Painting metal structures
Water Supply (a) Wooden Water Tanks (b) Impounding Reservoirs
Labor saving equipment
Small versus large gangs for maintenance work
Shipping company material economically
Bridge floors and guards
Use of concrete for railway purposes other than bridges and buildings
Experiences in restoring tracks after floods

ENTERTAINMENT

The entertainment features were limited to a banquet given by the Supply Men's Association on Wednesday evening and to an inspection trip through the Gary, Ind., plant of the American Bridge Company on Thursday afternoon. The banquet was held in the Hotel Sherman with about 360 members of the Bridge and Building and the Supply Men's Associations and their families present. Ninety-eight members of the Bridge and Building Association visited the bridge plant Thursday afternoon, where they were conducted through the plant and shown the various operations of steel fabrication.

MEMORIAL FOR SAMUEL F. PATTERSON

Tuesday evening was set aside for a memorial meeting in memory of the late Samuel F. Patterson, secretary emeritus and for 18 years secretary of the Association, who died in Chicago on April 17. A number of the members of the Association paid oral tribute to him and approximately 25 letters were read from members who could not be present. A fund was started and over $150 collected during the meeting for a memorial tablet from the Association for the grave at Concord, N. H.

THE SUPPLY EXHIBIT

The Bridge and Building Supply Men's Association held an exhibit in rooms adjoining the convention hall. The number of firms represented was considerably larger than at any previous conventions, while the exhibits were arranged more systematically than previously.

The officers of the Supply Men's Association for the past year were: President, H. A. Nealley, Joseph Dixon Crucible Co., Boston, Mass.; vice-president, L. D. Mitchell, Detroit Graphite Co., Detroit, Mich.; treasurer, P. C. Jacobs, H. W. Johns-Manville Co., Chicago; secretary, Tom Lehon, the Lehon Co., Chicago.

The following is a list of the firms exhibiting, the nature of exhibit and names of representatives:

American Abrasive Metals Co., New York; "Feralun" slip-proof treads. Represented by H. Weaver Mowery.

American Tar Products Co., Chicago; samples of tar products. Represented by P. L. Griffiths and S. H. Fields.

American Valve & Meter Co., Cincinnati, O.; literature and models. Represented by J. T. McGarry and D. J. Higgins.

John Baker, Jr., Co., Chicago; asphalt-impregnated mineral matter paving blocks. Represented by Wm. Howe and R. M. Elder.

The Barrett Co., New York; Holt roof connection, Tarvia platforms, ready roofing, built-up roofing, waterproofing, shingles, paints, wood preservatives, shingle stains and plastic cement. Represented by E. J. Caldwell, G. R. McVay, C. F. Ames, J. J. Ross, F. W. Freeman, T. A. Warton, W. T. Kelley, H. W. Flemming, J. A. Clarity, E. P. Hobson and H. E. Barney.

Bird & Son, Chicago; samples of neponset roofing. Represented by M. L. Caton and H. A. Inwood.

Carbic Mfg. Co., Duluth, Minn.; Carbic flood lights. Represented by Gordon Paterson and Harry Bolinder.

Philip Carey Company, Cincinnati, O.; literature and samples of prepared roofing. Represented by C. L. Cockrell and F. R. Schueler.

Chicago Bridge & Iron Works, Chicago; photographs and transparencies of tanks. Represented by M. J. Trees and H. C. Brown.

Detroit Graphite Co., Detroit, Mich.; literature. Represented by L. D. Mitchell, T. R. Wyles, W. D. Waugh and J. J. Hogan.

Paul Dickinson Co., Chicago; adjustable cast iron chimneys, models of Aeolus building ventilators and smoke jacks. Represented by C. F. Buchanan and A. J. Filkins.

Joseph Dixon Crucible Co., Boston, Mass.; Dixon's silica-graphite paint for bridges, buildings and water tanks, Dixon's crucibles, lubricants, boiler graphite and Eldorado pencils. Represented by H. A. Nealley and F. R. Brandon.

The Duff Manufacturing Co., Pittsburgh; lifting jacks. Represented by E. A. Johnson and C. N. Thulin.

Fairbanks, Morse & Co., Chicago; literature. Represented by A. A. Taylor, F. M. Condit, L. H. Matthews, E. C. Golladay, D. K. Lee, E. J. Coverdale, J. L. Jones, G. Howard and F. P. Drinker.

Flintkote Manufacturing Co., New York; shingles, roofing and construction roofs. Represented by G. Ellingwood.

H. W. Johns-Manville Co., Chicago; asbestos roofing and asbestos smoke jacks. Represented by P. C. Jacobs, W. H. Lawrence, D. L. Jennings, C. E. Murphy, W. D. Otter, J. H. Trent, E. H. Willard and J. C. Younglove.

The Lehon Company, Chicago; roofing, building papers and water-proofing fabrics. Represented by Tom Lehon and D. B. Wright.

C. F. Massey Co., Chicago; photographs and literature on reinforced concrete products. Represented by C. F. Massey and J. E. Moody.

Mineral Products Company, Chicago; composition flooring. Represented by Chas. V. Eades.

Mudge & Company, Chicago; Solvit compound paint remover, photographs and literature. Represented by Burton W. Mudge and Geo. W. Bender.

Geo. P. Nichols & Bro., Chicago; model and photographs of transfer table. Represented by George P. Nichols and Henry Fries.

Patent Vulcanite Roofing Co., Chicago; literature and samples of prepared asphalt roll and shingle roofing. Represented by H. A. Van Page and J. P. Woolsey.

Pyrene Mfg. Co., New York; fire extinguishers. Represented by R. B. Henderson and W. B. Caulson.

Railway Review, Chicago; current issues of paper. Represented by Harold A. Smith and J. E. Gougeon.

Simmons-Boardman Publishing Co., New York and Chicago; current issues of the *Railway Maintenance Engineer* and the Railway Age Gazette. Represented by L. B. Sherman, E. T. Howson and J. H. Cross.

Standard Asphalt & Refining Co., Chicago; literature and samples of roofing products. Represented by R. F. Trumbull and E. K. Carter.

U. S. Wind Engine & Pump Co., Batavia, Ill.; literature. Represented by C. E. Ward and L. E. Wolcott.

Volkhardt Co., Inc., New York; non-freezing water hydrants. Represented by Wm. Volkhardt and Chas. P. Cogswell.

Whiting-Evans Mfg. Co., Chicago; kerosene carburetors. Represented by F. R. Callans.

At the annual business meeting on Thursday morning the following officers were elected for the ensuing year: President, L. D. Mitchell, Detroit Graphite Co., Detroit, Mich.; vice-president, P. C. Jacobs, H. W. Johns-Manville Co., Chicago; treasurer, Tom Lehon, The Lehon Company, Chicago; secretary, C. E. Ward, U. S. Wind Engine & Pump Co., Batavia, Ill. Members of executive committee: E. J. Caldwell, The Barrett Company, New York; E. T. Howson, the *Railway Maintenance Engineer*, Chicago.

MAINTENANCE OF WAY PAINTERS' CONVENTION

THE fourteenth annual convention of the Maintenance of Way Master Painters' Association of the United States and Canada, was held at the Hollenden hotel, Cleveland, Ohio, on October 16 to 18, inclusive. Forty members registered.

The officers for the past year were: President, F. C. Rieboldt, master painter, Chicago, Milwaukee & St. Paul, Milwaukee, Wis.; first vice-president, H. E. Conrad, master painter, Pennsylvania Railroad, Huntington, Pa.; second vice-president, A. E. Wilson, master painter, New York, New Haven & Hartford, Hartford, Conn.; secretary-treasurer, F. W. Hager, master painter, Fort Worth & Denver, Fort Worth, Texas.

A paper by C. F. Loweth, chief engineer of the Chicago, Milwaukee & St. Paul, which, because of an unavoidable absence, was read for him, was entitled, "Painters and Painters." It was designed to give the master painter a broader view of life and point out his relation to the painters of other times and to other lines of endeavor.

Edward H. Brown, editor of the painters' Magazine, gave an extemporaneous talk on the present paint material situation. A committee report on the painting of water tanks, presented by Bert E. Darrow, master painter, Atchison, Topeka & Santa Fe, Kansas City, Mo., covered recommended practice for ladders, scaffolds and lines to insure the safety of the workmen when painting the exterior of water tanks. The discussion of this paper led to the outlining of methods used on various roads and the measures taken to insure safety when painters were at work close to the tracks. W. S. Lacher, managing editor of the *Railway Maintenance Engineer,* Chicago, pointed out the lack of accurate information on the volume of painting done in the maintenance of way department of American railroads. He gave some approximate figures on the amount of paint used by the railroads and urged that it would be of interest to have more accurate data.

H. S. Bird, master painter, Philadelphia & Reading, Philadelphia, Pa., presented a committee report on the painting of bridges, covering workmanship, materials and methods. Papers were also presented by H. F. Jones, master painter, Cleveland, Cincinnati, Chicago & St. Louis at Wabash, Ind., on methods of conducting painting to secure the greatest economy and insure safety of workmen and by H. B. Wilson, master painter of the Bessemer & Lake Erie, Greenville, Pa., on the finishing of floors. "Metal Protection" was the subject of a paper by Philip L. Maury of The Sherwin-Williams Cmpany, Cleveland, Ohio. This paper outlined the general requirements of metal coatings that would insure protection and demonstrated the relation of these requirements to the present situation in the paint field.

The election of officers for the coming year resulted in the selection of the following: President, H. E. Conrad, master painter, Pennsylvania Railroad, Huntington, Pa.; first vice-president, H. F. Jones, master painter, Cleveland, Cincinnati, Chicago & St. Louis, Wabash, Ind.; second vice-president, Ole Stubstad, master painter, Chicago & North Western, Winona, Minn.; secretary-treasurer, F. W. Hager, master painter, Fort Worth & Denver, Fort Worth, Texas. Chicago was selected as the place of meeting of the next convention, which will be held on October 15 to 17, 1918.

A detailed report of this convention will appear in the next issue.

THE MATERIAL MARKET

FROM the standpoint of the user of other than war materials, the program of government fixing of steel prices as carried out thus far has been more or less of a disappointment. The details of the first announcement of the agreement between the government and the manufacturers in regard to steel prices were given in last month's issue. These covered coke at $6, pig iron at $33 a gross ton, bars at $2.90 per 100 lb., shapes at $3 per 100 lb., plates at $3.25 per 100 lb. and copper at 23½ cents a lb. Subsequently prices have been established on blooms, billets, sheet bars, wire rods, shell bars and skelp, all of them items marking intermediate stages in the manufacture of finished products and of little interest to the purchaser of finished materials. All the prices fixed thus far cover purchases by the United States government, by the public in this country and our allies in the war. They do not affect existing contracts for materials and as most manufacturers have orders for many months in advance, the private purchaser has little opportunity to enjoy the advantage of the reduced prices. This is even true of contracts for fabricated structural steel placed at the present time since most of the bridge companies have contracts for plain material still in effect.

Because of uncertainty as to a possible extension of the program of price-fixing, the purchases have been few and far between during the last month, and in consequence, the prices of a month ago are being quoted as the present nominal prices. Thus angle bars are 3.75 to 4 cents per lb. at Pittsburgh, 3.25 to 4 cents per lb. at Chicago; spikes are 6.5 to 7 cents per lb. at Pittsburgh, 5 to 5.25 cents per lb. at Chicago; track bolts are 5.5 to 8 cents per lb. at Pittsburgh and 5.25 to 6.5 cents per lb. at Chicago; tie plates are $70 to $75 per ton; nails are 4 cents per lb.; galvanized barbed wire is $4.85 per 100 lb.

The scrap market in the meantime has suffered declines in most items. Rails for rerolling are selling at from $33 to $37 per ton; relaying rails bring $44 to $60; heavy melting scrap is quoted at $27 to $28 at Pittsburgh as compared to $36 to $38 last month, and frog and switch scrap runs from $24 to $26 as compared to $29 to $34 a month ago.

The structural steel business has suffered a further diminution. During August the contracts received amounted to 68,000 tons, or equivalent to 38 per cent of the plant capacities of the country. During September the corresponding figure was 52,200 tons, or 29 per cent.

Lumber continues to advance slowly, with increases of $1 to $2 per 1,000 ft. b. m. in most items during the month. Deliveries introduce a serious obstacle in the marketing of lumber. A case recently brought to notice is that of a freight house at Cleveland, where, owing to the apparent impossibility of securing deliveries of pine or fir 12-in. by 12-in. sticks for posts and beams, resort was had to miscellaneous hard woods—oak, maple and beech, secured in Indiana. Only recently the government has commandeered all yellow pine 12-in. by 12-in. pieces of 30-ft. lengths and longer for use in ship building. Dimension timbers are also scarce because of the large quantities of this class of material used in the cantonments.

The situation in the paint field is presenting a serious problem to the painters. The production of flaxseed in this country for 1917 is below normal and with a crop failure in Argentine there will be a serious shortage of linseed oil. The turning of certain materials commonly used in paint pigments into other channels will also require a readjustment of paint practice.

GENERAL NEWS DEPARTMENT

THE PANAMA CANAL traffic has now been uninterrupted by slides for over one year, the last obstruction having been cleared September 7, 1916. The canal was opened for traffic on August 15, 1914.

THE BOSTON & ALBANY, after extended negotiations, has advanced the pay of track foremen 8 per cent, which is about half of what had been demanded. Laborers will have their pay advanced from $2.10 a day to $2.15.

S. M. FELTON, director general of railways, announces that 12 units of railway officers consisting of division superintendents and their staffs, under a general manager and two general superintendents, are to be sent to Russia to rehabilitate the Trans-Siberian Railway.

The National Railway Appliances Association announces that it will hold its annual exhibition at the Coliseum and Annex, Chicago, from March 18, 1918, to March 21, inclusive. Applications for space to be considered must be filed in the office of the secretary-treasurer, 122 South Michigan avenue, Chicago, not later than November 1, 1917.

W. W. ATTERBURY, vice-president of the Pennsylvania Railroad, who has been in charge of railroad affairs in France for several weeks under General Pershing, and who, on September 14, was appointed director general of transportation in that field, was nominated by President Wilson for the position of brigadier-general in the National Army on October 2, this rank taking effect August 5.

THE ERECTION of the Quebec bridge across the St. Lawrence River was completed successfully on September 20, when the 640-ft. center span was landed. This marks the conclusion of a project of unusual engineering interest, the completion of which was delayed by two disastrous accidents. This bridge forms part of the Trans-Continental railway line between Winnipeg, Man., and Halifax.

THE PRESIDENT of the United States has directed that additional railway regiments be organized to bring the total to 14 regiments. Nine of these have already been organized, but an increase is now authorized in the number of men in each company from 180 to 250. These regiments are organized under the direction of S. M. Felton, director general of railways. One regiment for the construction of light railways is now being organized at Camp Grant, Rockford, Ill.

THE ATCHISON, TOPEKA & SANTA FE has reduced payments for loss and damage to freight from $1,565,434 in 1908 to $649,180 in spite of an increase in gross freight earnings from $61,848,638 in 1908, to $91,432,429 in 1916. In this period the percentage of loss and damage claims paid to total freight earnings has decreased from 2.53 to 0.71. This has been brought about through the systematic study of the causes of claims and the adoption of means to prevent them by a system loss and damage committee.

THE CHICAGO, BURLINGTON & QUINCY, the Chicago, Rock Island & Pacific, the Michigan Central and the Chicago & Alton have filed claims for exemption for those of their train service employees coming within the age limit prescribed by the draft law, whose loss would cripple the efficiency of the roads. The requests made by the roads are not in the nature of applications for blanket exemptions, but are petitions for individual exemptions for those employees whose retention is most important from an operating standpoint.

PRESIDENT WILSON has nominated Robert W. Wooley, former director of the mint; Clyde B. Aitchison, solicitor for the valuation committee of the National Association of Railway Commissioners, and George W. Anderson, United States district attorney for Massachusetts, for appointment to the Interstate Commerce Commission. Mr. Wooley is nominated for a term ending December 31, 1920, to succeed the late Judson C. Clements; Mr. Aitchison for a term ending in 1921 and Mr. Anderson for a term ending in 1922; the latter two nominations being for additional commissioners authorized recently by Congress.

THE PENNSYLVANIA RAILROAD has established "beefless" days in its restaurant cars and restaurants on Tuesdays of each week to aid in conserving the beef supply of the country. The elimination of beef on this day will be complete and will apply not only to steaks and roast beef, but also to tongue, corned beef, rib-ends, oxtails, etc.

IF THE RAILWAYS of the United States continue their present rate of increase in the amount of freight traffic handled over that of a year ago this increase will be greater than the total freight traffic moved annually before the war by the combined railways of Germany, France, Russia, Spain, Sweden, Switzerland, Roumania, Holland, Canada, South Africa, Mexico, Japan, Brazil and New South Wales. At the present rate of increase the freight handled by the railways of this country during 1917 will be approximately 141,000,000,000 ton miles and approximately 510,000,000 tons greater than during 1916. On the basis of the number of tons now being handled per train it would take 720,000 trains containing 18,000,000 cars to haul this increase in tonnage, and if these cars were made up into a single train it would be 136,363 miles in length.

CHARLES A. PROUTY, director of the division of valuation, of the Interstate Commerce Commission, has filed a memorandum in the Texas Midland case, stating that while the solicitor's brief covers the legal points involved, the law of valuation is in such a plastic state that the decision of the commission will go far toward fixing the law in many instances, and he therefore confines himself to what he calls the practical considerations involved. Director Prouty says that while he fully concurs in the holding of the solicitor that the valuation act does not require the commission to find an ultimate value, it is still his conviction that an ultimate value for rate-making purposes should be stated, and that the full benefit of this valuation cannot be realized unless this be done. However, he says, this does not mean that any sort of the work now being done, or of the money now being expended, is thrown away because the commission is not required to establish at this time such ultimate value; for the facts are being prepared to be reported to Congress under the present act and "a final value can be quickly stated when Congress has determined by whom and possibly by what rule such value shall be determined."

THE EMPLOYMENT SERVICE of the United States Department of Labor recently created a branch known as the Teachers and Professional Service Division, the function of which is to aid the employer in obtaining suitable help and professional persons in securing suitable employment. While intended to embrace all professions, attention has thus far been confined to the teaching and engineering profession. Employers in reporting positions are asked to state the nature of the position, its duties, requirements, etc., the possible salary and the probable duration of employment. Applicants for registration should indicate in the first letter the nature of the position desired so that the proper blanks may be furnished. No service is rendered an applicant until the division has learned from persons familiar with him that he is qualified as to training, experience and personal qualities for the position he seeks. When an applicant is recommended for a reported vacancy, the employer is given an opportunity to examine the data gathered in the course of the investigation, thus effectually preparing for the final step, the personal interview, for which ample facilities are provided in the offices of the division. The services of the division are entierly free, the expenses being borne by the United States government. All communications should be addressed: Teachers and Professional Service Division, U. S. Employment Service, 845 South Wabash avenue, Chicago, Ill.

PERSONAL MENTION

GENERAL

H. B. TITCOMB, maintenance of way assistant for the northern district to the assistant chief engineer of the Southern Pacific at San Francisco, Cal., has been appointed superintendent of the Stockton division, with headquarters at Stockton, Cal., succeeding C. H. Ketcham, resigned, effective October 15.

ANDREW J. WHITNEY, superintendent of the Maryland division of the Pennsylvania Railroad, who has been appointed general superintendent of the Northern division with headquarters at Buffalo, N. Y., entered the service of the Pennsylvania in June, 1881, as a rodman. In 1886, he entered the maintenance of way department at York, Pa., becoming engineer right of way, and later held positions as assistant supervisor, supervisor, assistant engineer and acting superintendent, principal assistant engineer and superintendent.

E. P. BRACKEN, general manager of the Chicago, Burlington & Quincy, lines east of the Missouri river, who has been appointed vice-president in charge of operation of the entire system, entered railway service in August, 1887, as a track foreman of the Lincoln division of that road. From September, 1888, to November, 1905, he was consecutively extra gang foreman on the Wymore division for one year, roadmaster for 13 years and trainmaster for three years. In November, 1905, he was appointed assistant superintendent, since which time he has been in the operating department as division superintendent, general superintendent, assistant general manager and general manager.

H. B. VOORHEES, who has been appointed general superintendent of transportation of the Baltimore & Ohio, with headquarters at Baltimore, Md., entered railway service as an essistant supervisor on the Philadelphia & Reading after graduating as a civil engineer from Rensselaer Polytechnic Institute in 1896. He served in that capacity until March, 1898, when he was promoted to supervisor. In August of the same year he became assistant trainmaster, being promoted to trainmaster two years later. In 1901 he entered the services of the Baltimore & Ohio in the engineering department as assistant engineer, becoming division engineer in 1902, a position he held until September, 1903, when he was made assistant to the general superintendent. He held various positions continuously in the operating department until his recent appointment.

JOHN R. SAVAGE, chief engineer of the Long Island, with headquarters at Jamaica, N. Y., has been appointed acting general manager, succeeding J. A. McCrea, who has been granted a leave of absence. Mr. Savage was born in 1869 at Philadelphia, graduating from the University of Pennsylvania in June, 1889, in civil engineering. He entered railway service as a rodman with the Pennsylvania Railroad. In October, 1890, he joined the United States Engineering Corps as a transitman, subsequently becoming assistant engineer, a position he held until July, 1897, when he again took up civilian engineering work. Later in that year he entered the services of the Pennsylvania Railroad as an assistant engineer and in 1900 he became chief engineer of the Cornwall & Western Railroad. From August, 1901, to March, 1904, he held various positions with the Lackawanna Steel Company. He became chief engineer of the Long Island in April, 1904.

ENGINEERING

L. V. MORRIS, valuation engineer on the Long Island Railroad at New York, has been appointed acting chief engineer, succeeding J. R. Savage, now serving as general manager, as noted elsewhere.

H. W. WAGNER, district engineer of the Atchison, Topeka & Santa Fe at La Junta, Colo., has been promoted to chief engineer of the eastern lines, with headquarters at Topeka, Kan., succeeding R. A. Rutledge. Mr. Rutledge has been transferred to La Junta as district engineer on account of ill health.

J. H. GRAESER, office engineer of the St. Louis-Southwestern, with headquarters at Tyler, Tex., has been appointed division engineer at Mt. Pleasant, Tex., to succeed T. J. Williams, Jr., who has resigned.

S. BUFFINGTON has been appointed resident engineer of the Kansas City, Mexico & Orient, succeeding H. B. Holmes, chief engineer, who resigned to become associated with Coverdale & Colpitts, New York.

A. N. REECE, office engineer of the Kansas City Southern and the Arkansas Western, has been appointed division engineer of those roads, with headquarters at Pittsburgh, Kan., succeeding G. H. Cook, resigned, effective October 1.

FRANCIS M. WARING, acting engineer of tests of the Pennsylvania Railroad at Altoona, Pa., has been appointed engineer of tests. He was born in 1879 at Charleston, S. C., and is a graduate of Charleston high school and Virginia Polytechnic Institute. He began his railroad work with the Northern Central at Baltimore, Md., in November, 1898, and entered the services of the Pennsylvania Railroad in 1900. He was engaged largely in special work until 1912 when he entered the test department as a foreman of the physical laboratory. From June, 1917, until his recent appointment, he served as acting engineer of tests.

TRACK

E. C. CARTER has been appointed track supervisor on the Norfolk Southern with headquarters at Raleigh, N. C., vice R. G. Davis, resigned.

C. WHITFIELD, roadmaster of the Portland division of the Spokane, Portland & Seattle, has been appointed superintendent maintenance of way, with headquarters at Portland, Ore., the title of roadmaster having been abolished.

J. E. EMOND has been appointed acting roadmaster of the second district of the Pecos division of the Atchison, Topeka & Santa Fe, with jurisdiction between Vaughn, N. M., and Belen and with headquarters at Clovis, N. M., succeeding M. A. McNeill, who has resigned.

W. H. KOCH, supervisor on the Pennsylvania division of the Delaware & Hudson, has been transferred to the position of roadmaster in charge of subdivisions D and E of the Susquehanna division, with office at Oneonta, N. Y., succeeding M. J. Nugent, whose appointment as track inspector with headquarters at Albany, N. Y., was announced recently in these columns.

J. E. WILKINSON, roadmaster on the Chicago & North Western at Green Bay, Wis., has been transferred to the Chicago Terminal district at Chicago, succeeding H. A. Halverson, who has entered military service. E. W. WALSH, roadmaster at Ironwood, Mich., has been transferred to Green Bay to succeed Mr. Wilkinson and GUSTAVE DARROW has been appointed roadmaster at Ironwood, succeeding Mr. Walsh.

GEORGE KUHN, whose appointment as roadmaster on the Missouri Pacific, with headquarters at Auburn, Neb., was announced last month, was born in October, 1872. He began his railway experience as a section laborer on the Missouri Pacific in 1888 at Leavenworth, Kan. After being employed in this capacity until May, 1898, he was made section foreman at Leavenworth, and continued in charge of the section at that place until August, 1917, except for a few intervals when he was employed as an extra gang foreman. On the above date he was appointed roadmaster of the Talmadge, Lincoln and Crete branches, as previously noted.

BRIDGE

MARTIN KANE, master painter of the Delaware & Hudson, with headquarters at Albany, N. Y., has been placed in charge of all building work on that road.

CHARLES SEDMORADSKY, district foreman of the Chicago, St. Paul, Minneapolis & Omaha, has been appointed general foreman of bridges and buildings of the west end of the Western division, with headquarters at Worthington, Minn., succeeding J. F. Glasgow, who has been assigned to other duties. He entered the service of the Omaha as a carpenter in June, 1905, and in 1907 was promoted to carpenter foreman, which position

he held until he was appointed general foreman of the Northern division. In 1912 he was transferred to the Eastern division in the same capacity and in 1914 was made district foreman, which position he held when made general foreman, as noted above.

T. H. THOMPSON, bridge foreman and piledriver engineer on the Chicago, St. Paul, Minneapolis & Omaha, has been appointed scale inspector with jurisdiction over the entire system with headquarters at St. Paul, Minn., succeeding A. P. Loken, who has been assigned to other duties. Mr. Thompson entered the service of this road as a carpenter in July, 1907. In 1912 he became a piledriver engineer and bridge foreman, which position he held when he was appointed scale inspector.

PURCHASING

ROBERT E. SCOTT, assistant roadmaster of the Oregon Electric, has been appointed purchasing agent of the Spokane, Portland & Seattle, with headquarters at Portland, Ore.

G. H. WALTERS, engineer of tests in the stores department of the Chicago, Milwaukee & St. Paul of Milwaukee, Wis., has been appointed assistant purchasing agent, with office at Chicago, succeeding A. J. Jennings, resigned.

W. E. STEEN, storekeeper of the Baltimore & Ohio, with headquarters at Washington, Ind., has been appointed district storekeeper with jurisdiction over the Southwest district. H. Shoemaker, district storekeeper at Cincinnati, will have jurisdiction over the Northwest district and Chicago terminals.

IN MILITARY SERVICE

H. A. HALVERSON, roadmaster on the Chicago Terminal district of the Chicago & North Western at Chicago, has resigned to enter military service.

H. W. YOUNG, assistant engineer on the Union Pacific, has been appointed captain in the Eighth Regiment, Engineering Corps, United States Army.

B. M. LOCKARD, assistant engineer in the engineering department of the Chicago & North Western, has received a commission as captain in the Engineer Officers' Reserve Corps.

W. A. HILL, assistant engineer in the valuation department of the Chicago, Burlington & Quincy, at Chicago, has been commissioned major in the Engineer Officers' Reserve Corps.

A. C. BRADLEY, division engineer on the Chicago, Rock Island & Pacific at El Reno, and C. C. CUNNINGHAM, division engineer at Herrington, Kan., have received commissions in the Engineer Officers' Reserve Corps.

H. J. SLIFER, consulting engineer, Chicago, formerly general manager of the Chicago Great Western, has been commissioned major of the Twenty-first Engineers, a new railway regiment being recruited at Rockford, Ill.

BYRON L. KELSO, until recently assistant engineer in the valuation department of the Chicago, Burlington & Quincy, with headquarters at Chicago, has received a commission as captain in the Engineer Officers' Reserve Corps.

W. K. ADAMS, formerly bridge engineer of the National Railways of Mexico, has been commissioned captain in the Engineer Officers' Reserve Corps, and has been assigned to duty with the Twenty-first light railway regiment at Rockford, Ill.

E. N. SANCTUARY, president of the Oxy-Acetylene Appliance Company, New York, has been commissioned a captain in the Engineer Officers' Reserve Corps, and has been assigned to the Washington office of S. M. Felton, director general of railways in charge of the personnel for new railway troops being organized for service abroad.

OBITUARY

M. P. THORNTON, formerly general roadmaster of the Missouri, Kansas & Texas, and later roadmaster of the St. Louis Southwestern and the Missouri Pacific, died on October 7 at St. Louis, Mo.

CONSTRUCTION NEWS

THE CHESAPEAKE & OHIO plans to build an engine house and shop building at Raliegh, W. Va., but the work has not yet been authorized.

THE CHICAGO, MILWAUKEE & ST. PAUL has recently awarded a contract to C. Matson & Son, Tacoma, Wash., to construct a 5½-mile spur from Greendale, Wash., to American Lake, where the cantonment, Camp Lewis, is located. The cost of the work will be approximately $35,000.

THE CHICAGO SHORT LINE has begun the construction of a one-story engine and car repair shop with basement at South Chicago, Ill. The building will be a brick structure, 120 ft. by 150 ft., and will cost about $30,000. Freyn & Co., Chicago ,have the contract.

THE CUYUNA SOUTHERN will build a line from Deerwood, Minn., to St. Paul.

THE EASTERN TRACTION is a company being organized to build an interurban electric line from Houston, Texas, east via Beaumont to Orange, thence south towards Lake Charles, La.

THE GREAT NORTHERN has let a contract for the grading of a second track between Cut Bank, Mont., and Blackfoot, 26 miles, to Porter Brothers, Spokane, Wash. The work will cost approximately $100,000 and involves no bridge work.

This road recently commenced the construction of a freight warehouse, 60 ft. by 800 ft., on Pine street between Eighth street and Van Slyke court, St. Paul, Minn. The building will be of brick and concrete construction, two stories high with a basement for half the length, and one story with no basement for the remainder of the length. The completed structure will cost approximately $100,000. W. L. Johnson, St. Paul, has the contract.

THE GULF, COLORADO & SANTA FE will construct a reservoir at Valera, Tex., with a capacity of about 360,000,000 gal., which will require a pipe line 10½ miles long. The dam will be of earth with a core wall through the center and a concrete spillway.

THE HOCKING VALLEY has authorized the construction of second track between Delaware, Ohio, and Marion, 21 miles; Crawford and Cary, 2 miles; and Le Moyne and Cummings, 4 miles, at an estimated cost of about $1,300,000. The work will include some realinement and grade reduction, 3 highway grade crossing eliminations and some concrete arches. The grading will amount to about 20,000 cu. yd. per mile. A considerable portion of the work will be done by force account and no contracts have been let to date.

THE ILLINOIS CENTRAL is preparing plans for a combination freight and passenger station at Litchfield, Ill., which will cost about $35,000. The building will be a one-story structure, 120 ft. by 30 ft., with brick walls and tile roof.

This company plans to build a store and oil house at Jackson, Tenn., which will cost about $50,000. This building will be of irregular shape, the larger part being 37 ft. by 175 ft., one story high, and the smaller part 37 ft. by 72 ft. and two stories high. All of the buildings will have brick walls and a slate roof. The second floor will provide offices for the master mechanic, while the basement will contain oil tanks for the storage of oil.

This road has awarded a contract to Joseph E. Nelson & Sons, Chicago, to construct a 14-stall round house and other mechanical facilities at Mattoon, Ill., which will cost about $100,000.

The company will make some improvements at Kankakee, Ill., and has awarded a contract to George B. Swift & Co., Chicago, to build a 9-stall round house, an 85-ft. turntable and other mechanical facilities, which will cost approximately $100,000. In addition to these improvements at Kankakee, a 4-track 570-ft. concrete bridge will be built which will cost about $100,000. The Gould Construction Company and the

Walsh Construction Company, Davenport, Iowa, have the contracts for this work.

This company has purchased land on the east side of its right of way between One Hundred and Fifty-seventh and One Hundred and Seventy-fifth streets, Chicago, and will use it for a freight yard. The total estimated expenditure for improvements, including grading, buildings and equipment, is $1,250,000.

THE KINDER & NORTHWESTERN is contemplating the construction of 35 miles of line to connect this road with other local lines, mainly in lumber service, and will proceed as soon as approval of the consolidation of the companies involved is received from the Interstate Commerce Commission.

THE MINNEAPOLIS & ST. LOUIS will soon award a contract for the erection of a bridge over the Minnesota river near Carver, Minn. The steel, consisting of six deck-girder spans weighing 440,000 lb., was fabricated last year, and the foundation work, consisting of reinforced concrete on piling, has been started by the Widell Company, Mankato, Minn.

THE NORTHERN PACIFIC has started laying track on its Lake Basin branch, extending 38 miles northwesterly from Hesper, Mont., a station on the Great Northern about five miles north of the junction between the Great Northern and the Northern Pacific near Laurel, Mont. About 90 per cent of the grading on the line has been completed, bridges are all finished and the road expects to complete tracklaying late in the fall.

THE PHILADELPHIA & READING has awarded a contract to Henry E. Baton, Philadelphia, Pa., to build a 15-stall one-story engine house at Reading, Pa. The building will be of reinforced concrete and brick, and will be 110 ft. wide and 418 ft. long.

This company has just been started on the construction of a one-story addition to freight house No. 4 at the corner of Noble and New Market streets, Philadelphia, Pa. The extension will be 83 ft. wide by 129 ft. long and 20 ft. high. The structure is to have steel columns, and girders, with brick walls and timber roof, covered with slag roofing. The contractor is A. L. Carhart, Philadelphia.

THE OREGON SHORT LINE has awarded a contract to the Utah Construction Company, Ogden, Utah, for the construction of a line from Garland, Utah, south along the west bank of Bear river to Bear River City, Utah, 9.7 miles. It will connect the line from Corinne, Utah, to Malad, Idaho, to the line from Ogden, Utah, to McCammon, Idaho. The maximum grade will be 1½ per cent and the maximum curvature 3 deg. The grading work will be light, involving an average cut of 3 ft. and an average fill of 2 ft. The only structures to be built are 20 spans of trestles. About 60 per cent of the grading is completed. The company has completed grading, involving a fill of between 1 and 2 ft., on a spur from Bakers, Utah, north 3.8 miles.

THE PELLA-LEFFLER SHORT LINE has been incorporated with $300,000 capital stock to build a line from Pella, Iowa, to a junction with the Wabash, about 4½ miles.

THE SHELBYVILLE & FRANKFORT plans to build an electric line from Shelbyville, Ky., east, to connect with Clay Village, Peytona, Grafenberg and Bridgeport, about 20 miles. The work will include building four steel bridges and two power houses. Contracts are expected to be let in the near future, and construction work completed in 1918. The company expects to develop a traffic in farm products. E. H. Taylor, Jr., president, Frankfort, Ky.

THE SOUTHERN PACIFIC plans to double track its line between Stockham, Ariz., and Polvo, a distance of six miles. This section extends approximately three miles each way from the division terminal at Tucson. The work will be very light outside of tracklaying and ballasting.

This road has instituted a program of extending every passing track between Blue Canon, Cal., and Truckee to enable the company to handle trains of 55 to 57 cars instead of 45 as at present. Over $12,000,000 has been spent on the construction of second track from Rocklin, Cal., to Colfax; Colfax to Blue Canon, and Sparks, Nev., to Truckee, Cal., in recent years.

THE SOUTHERN PACIFIC, TEXAS LINES (Galveston, Harrisburg & San Antonio) is building a line from Rosenberg, Tex., through Needville, to Damon Mound, 21 miles. M. M. Cravens, Rosenberg, Tex., has the contract for the grading, 25 per cent of which has been completed. The work involves the handling of about 15,000 cu. yd. per mile.

SUPPLY TRADE NEWS

GENERAL

THE MACLEOD COMPANY, Cincinnati, manufacturers of sand blast equipment and metallurgical furnaces, will enlarge its plant and increase its capital to $100,000.

BERRY BROTHERS, varnish manufacturers, Detroit, Mich., have prepared an illustrated folder containing instructions on how to recognize military insignia, together with a full page half-tone display of the various marks of rank and distinction in the army and navy.

THE TAYLOR WHARTON IRON & STEEL COMPANY, Easton, Pa., celebrated the 175th anniversary of its organization at High Bridge, N. J., on Saturday, October 13. The program for the day included an inspection of the plant, a historical pageant, a clam bake and concerts during the day and evening.

THE UNITED STATES SWITCH COMPANY, Eau Claire, Wis., has been incorporated for $1,750,000 to manufacture the Shepherd automatic railway switch, the Hubbard automatic railway switch, the Shepherd automatic street car switch and other railway appliances. This company has purchased a site and factory buildings at Eau Claire, and plans to construct other buildings at once.

THE UNION CARBIDE & CARBON CORPORATION has been organized in New York with a capital of 3,000,000 shares without stated par value. The new organization proposes to absorb the Union Carbide Company, the National Carbon Company, the Prest-O-Lite Company and the Linde Air Products Company. Myron T. Herrick will be chairman of the corporation's board of directors, and George O. Knapp, president of the Union Carbide Company, will be president.

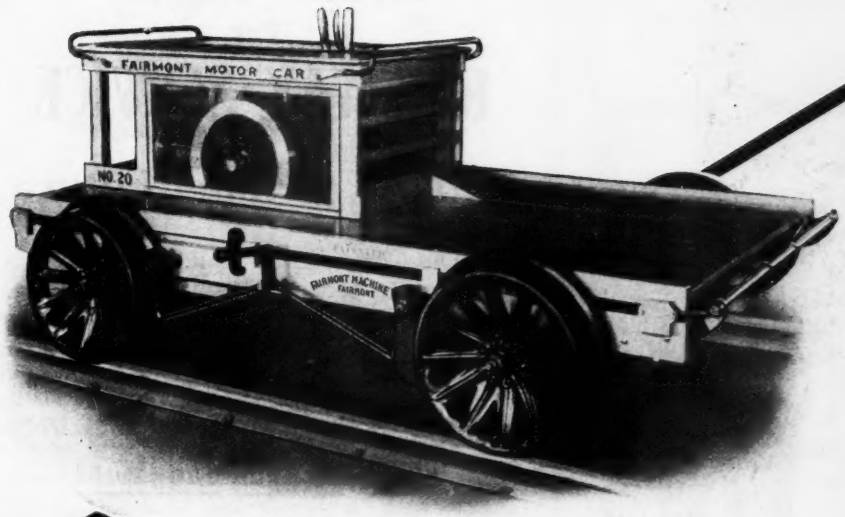
PERSONAL

MAJOR ROBERT H. MURRAY, formerly general manager of the Chicago Bridge & Iron Works, Chicago, is now in command of the first battalion 311th Engineers, Camp Grant, Rockford, Ill. He first received a commission as captain, but following a period of training at Fort Leavenworth, Kansas, he was promoted to major.

FRANK B. ARCHIBALD, for the past five years eastern manager of the National Lock Washer Company, has been elected vice-president; J. Howard Horn, eastern representative for the past seven years, has been appointed sales manager. On or about December 1, offices will be opened in Philadelphia, Pa., and St. Louis, Mo., these in addition to present offices in Chicago and Detroit, Mich.

JOHN E. WOODS, formerly manager of sales of the Carnegie Steel Company, the Illinois Steel Company and the Tennessee Coal, Iron & Railroad Company at Cincinnati, Ohio, has been appointed assistant general manager of sales of the Carnegie Steel Company, succeeding John W. Dix, who died on April 28. The advertising and statistical work of the Carnegie Steel Company has been separated from the sales work proper, and R. B. Woodworth has been appointed advertising manager and sales statistician with headquarters at Pittsburgh, Pa., effective October 1.

BURWELL S. CUTLER of Buffalo has been appointed chief of the Bureau of Foreign and Domestic Commerce, Department of Commerce, was confirmed by the Senate October 5. Mr. Cutler, who is well known in manufacturing circles in western New York, came into the bureau six months ago at a nominal salary to assist in putting the organization on a thoroughly business basis. He was made first assistant chief, but since the resignation of Dr. E. E. Pratt, has been acting chief. Mr. Cutler was born in Buffalo and finished his scholastic education at Lake Forest University and Harvard. For fifteen years he has been president of an important Buffalo manufacturing concern and has been identified in an official capacity with numerous business houses and civic organizations throughout New York State.



THERE'S A FAIRMONT CAR BUILT FOR EVERY BRANCH OF RAILWAY SERVICE

FAIRMONT

BRIDGE GANG CARS

Are superior to other bridge and extra gang cars because they stand the "hard knocks" of this service. Their unusual tractive power permits handling a string of trailers loaded with material and men. In fact, the car illustrated pulls FIVE TIMES the load that ordinary section motor cars pull. Proof! Yes, plenty of it—ask any owner of a Fairmont bridge gang car—there are thousands of them everywhere—what he thinks of them. Or, ask to see some of the hundreds of letters received recently from satisfied owners all over the continent.

Uncle Sam Will Use Fairmont Motor Cars

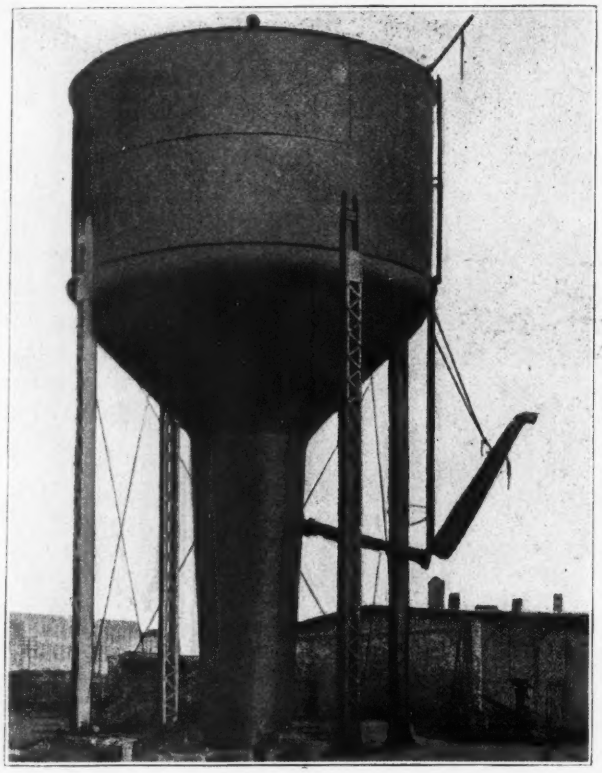
Uncle Sam knows a good thing when he sees it. That's why he chose FAIRMONT cars for use of our armies in Europe. Within a few weeks more than 400 of these motor cars will be "doing their bit" in the fight for democracy.

May we send you complete information?

WRITE TO

FAIRMONT GAS ENGINE & RAILWAY MOTOR CAR CO.

423 N. Main Street, Fairmont, Minn., U. S. A.



Capacity 50,000 Gals. Height 20 Ft. to Bottom
Chicago & Northwestern Ry.

STEEL TANKS
For
RAILWAY SERVICE

Build For The Future

The Corporations which show the most enviable dividend record over a period of years are those which have followed this policy.

A Steel Tank Is An Asset That Does Credit To Your Judgment

Chicago Bridge & Iron Works

SALES OFFICES
Chicago, Ill. Charlotte, N. C.
New York, N. Y Salt Lake City, Utah
Dallas, Tex. Seattle, Wash.
Jacksonville, Fla. Los Angeles, Cal.
Detroit, Mich. SanFrancisco, Cal.
Havana, Cuba Bridgeburg, Ont.

SHOPS
Eastern: Greenvile, Pa.
Pittsburgh Dist.
Central: Chicago, Ill.
Canadian: Bridgeburg, Ont.

CABLE ADDRESS
"Chibridge Chicago"

SHERWIN-WILLIAMS

CARBOLIC-OL

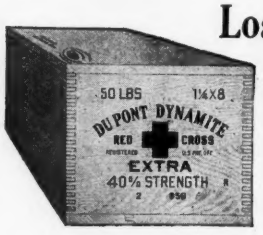
WOOD PRESERVATIVE
A PURE COAL-TAR OIL

COVER THE EARTH

For Brush Treatment of Bridge Timbers, Poles, Ties, Cross-Arms, Pins, Platforms, Etc.

THE SHERWIN-WILLIAMS CO.
Paint and Varnish Makers

Address Inquiries to
601 Canal Road, N. W. CLEVELAND, OHIO



Load Bore Holes With Red Cross Extra

The Universal Explosive

Red Cross Extra Dynamite is a LOW FREEZING, all-the-year-round, high efficiency explosive especially

Adapted to Contracting

It is made in all standard strengths from 20 to 60% and guaranteed to be as represented by cartridge markings.

Red Cross Extra Dynamites are as strong, stable and efficient as any other standard explosive.

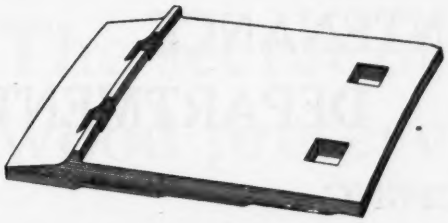
If no test of Red Cross Extra has been made, make one at once—it is the least expensive and most efficient explosive.

Tell us what your blasting work is. Let us suggest efficient and economical ways to use Red Cross Explosives.

E. I. du Pont de Nemours & Co.

Wilmington, Del.
POWDER MAKERS
SINCE 1802

DU PONT



THE LUNDIE TIE PLATE

The Lundie Tie Plate is widely acknowledged by railroad men having such plates in track, as promoting decided economy in rail wear, in holding track to gauge and in giving easy riding track. It will far more than pay for itself in reduction of Operating Expenses.

The features of the plate are—a sloping seat inclining the rail, so reducing abrasion and internal stresses in the rail to a minimum—a true camber promoting easy riding —and a bottom, as shown in the cut, so seating itself on the tie that the track is held firmly to gauge without injury to the tie.

The combination of these features, or their mechanical equivalent, is covered by Letters Patent, supported by other Patents covering certain individual features of the plate. Railroad companies pay no royalties on its authorized use.

The undersigned, as the original promoter of the principles embodied in the Lundie Tie Plate, offers plates for sale in fair competition with any other plate in the market, depending on its proven merits for its extended use.

JOHN LUNDIE, 52 Broadway, NEW YORK

Doing Your Bit—

—these days and each man increasing his own efficiency is made easier by the use of

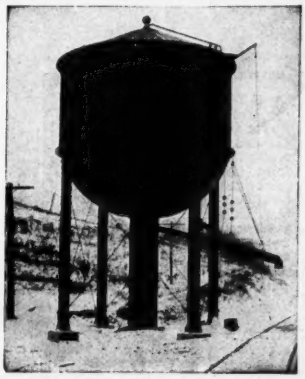
Toledo Pipe Threaders

Thousands of "Toledos" are in use in Government Army Camps, Navy Yards and the battleships. A complete equipment of "Toledos" will accompany the Division of U. S. A. Railroad Engineers to France. Everywhere pipe must be threaded, Uncle Sam is specifying "Toledos," for he has used them on government jobs for years and knows he can depend on them to produce results.

You will find "Toledos" just as efficient as the government officers are. Ask us for a copy of the "Toledo" Hand Book.

THE TOLEDO PIPE THREADING MACHINE CO. TOLEDO, OHIO

NEW YORK OFFICE, 50 CHURCH ST. 369 RUDSON TERMINAL



Capacity, 60,000 gallons. Height, 36 ft. 8 in. to top.

STEEL RAILWAY SERVICE TANKS

FOR

PERMANENCE AND NEGLIGIBLE MAINTENANCE COST

WRITE FOR RAILWAY BOOKLET NO. 28

We manufacture and erect Elevated Steel Tanks and Standpipes for every service

Des Moines Bridge & Iron Co.

Des Moines, Iowa, 912 Tuttle St.

Pittsburgh-Des Moines Steel Co.

Pittsburgh, Pa., 920 Curry Building. New York City, 55 Church St. San Francisco, Cal., 5000 Rialto Bldg. Chicago, Ill., 1290 First National Bank Bldg. Dallas, Texas, 1285 Praetorian Bldg. Chatham, Ont., 299 Inahes Ave.

Shops—Pittsburgh, Pa. Des Moines, Ia.

Canadian Shop—Canadian Des Moines Steel Co., Ltd., Chatham, Ont.

LIDGERWOOD HOISTS

Steam, Electric and Gasoline

For Pile Driving, Derricks, Bridge Erection, Coal Towers, Etc.
Draw Bridge Engines, Ballast Unloaders, Excavators, Cableways

Write for Catalogues

LIDGERWOOD MANUFACTURING CO.

96 Liberty Street, New York

Philadelphia Pittsburgh Chicago Los Angeles Seattle London, Eng.

POINTS FOR THE MAINTENANCE DEPARTMENT

DITCHING

- POINT 1—Cut out your Labor Item.
- POINT 2—Avoid Traffic Delays.
- POINT 3—Save from one-third to one-half of your yardage cost.

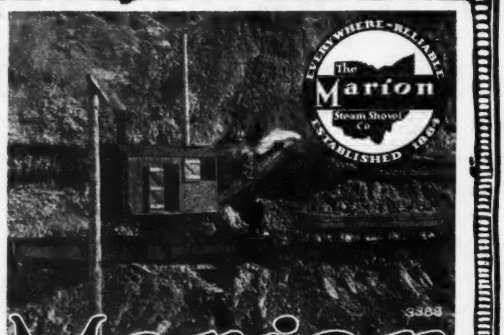
BY USING TWO WESTERN AIR DUMP CARS WITH YOUR DITCHER BETWEEN

Write for copy of "Railroad Ditching and Trestle Filling"

WESTERN WHEELED SCRAPER COMPANY

Earth and Stone Moving Machinery

AURORA . . . . . ILLINOIS



Marion

Steam Shovels, Dredges, Draglines and Kindred Machinery

WHEN someone says "See America First" you immediately think of the Great Northern Railway; in just the same way do the officials of that famous system think "Marion" in connection with the terms "Ditching Machines," "Steam Shovels," or any kind of "Excavating Machinery."

For the Great Northern Railway and The Marion Steam Shovel Company are business friends in the strictest sense;—

Marion Ditchers and Marion Shovels Do "Great Northern's" Big Work

and small work, too—whether it's constructing new lines or opening up ditches along existing rights-of-way.

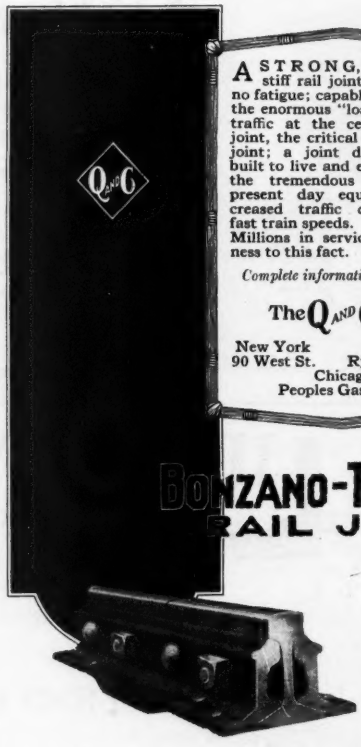
May we suggest that an investigation might develop just as interesting possibilities for using "Marions" in your own work?

We should heartily welcome that, and will gladly assist you in making it. Your request for particulars will not obligate you.

The Marion Steam Shovel Company, Marion, Ohio

Branches: Atlanta, Chicago, New York, Philadelphia, San Francisco, Seattle

225 ESTABLISHED 1884



A STRONG, rugged and stiff rail joint that knows no fatigue; capable of resisting the enormous "load waves" of traffic at the center of the joint, the critical point of the joint; a joint designed and built to live and endure under the tremendous weight of present day equipment, increased traffic density and fast train speeds.
Millions in service bear witness to this fact.

Complete information on request

The Q AND C Co.

New York 90 West St.
St. Louis Ry. Exc. Bldg.
Chicago Peoples Gas Bldg.

BONZANO-THOMSON RAIL JOINT

"The Joint as Strong as the Rail"

The secret of permanent wood preserving

lies primarily in the character of the oil which is used.

The empty cell process has been definitely proved to be the most efficient and economical method of treating wood paving blocks, ties, bridge timbers, telephone cross-arms, and all other timbers that can be handled in this manner.

The life of wood so treated depends strictly upon the purity of the oil and the amount of permanent elements which it contains.

Judged on this basis, Reilly's Improved (Permanent) Creosote Oil is far superior to any other. For it has three times as much permanent body as the next highest grade—and it contains no trace of coal tar or other adulterants.

Wood blocks and timbers treated with this superior product will never bleed—swell—absorb matter—or fail under the attacks of insects or decay. When distilled at 315 degrees C. more than 75% remains.

It stays in the wood forever. Use it for your own operations. Write it into your contracts.

REILLY'S IMPROVED PERMANENT PATENTED CREOSOTE OIL

Republic Creosoting Co.

Indianapolis, Indiana

PLANTS: Indianapolis Mobile Seattle Minneapolis

For Brush Treating we offer Reilly's Wood Preservative Oil—a high boiling anthracene oil which has great penetrative powers and does not dissolve or evaporate from the wood under the most extreme climatic conditions. It coats the surface and fills every cell and fibre with a permanent body of oil that prevents the entrance of water—decay—or insects.

"How can I Help?"

FLAGS are flying. Bands are playing. Crowds are cheering. Uniforms are passing in the street.

The world will soon feel the militant might of a great peaceful people.

An old-time writer, Dryden, once said, "Beware the fury of a patient man."

That old lesson must be re-taught.

Uncle Sam is about to strike.

The kindly, sympathetic uncle of the world will soon unloose his power in defense of human rights.

We, the people of this country, are behind him.

His force will be *our* force.

His ability to help mankind will be measured by our promptness in helping *him*.

So "How can I help?" is today a universal question in the minds of American men and women.

We have one chance now.

Uncle Sam—the same Uncle Sam who for decades past has guarded over a happiness and prosperity which have stood as models to the world—now asks you to loan him money.

He cannot knock at the door of each of us.

But his request for a loan is just as personal, just as individual as it would be if he rang your doorbell tomorrow morning and personally said, "Please lend me money."

The money that Uncle Sam borrows will go for food for your army (and it must be fed); it will go for uniforms, ammunition and equipment; it will go for ships and construction; it will go toward putting a support behind our flag which will be worthy of the stars and stripes upon it.

Every dollar of the money will go for something which, in Uncle Sam's judgment, is necessary for your protection, or for human welfare.

No matter where the money goes, your Uncle Sam stands responsible for the repayment.

We are asked to loan money in amounts of $50, $100, $1,000 and up. In return for each loan Uncle Sam will give us an I. O. U.—an engraved slip of paper called a Government Bond—on which he promises to pay back the loan, and to pay us in the meantime interest of 4% per year.

So high does the credit of Uncle Sam stand, that should you at any time be pressed for funds, the bank around the corner will loan you close to the full amount which you loaned Uncle Sam. You merely deposit Uncle Sam's I. O. U.'s—your Government Bonds—as security.

If you feel that your Uncle Sam is worth a loan of $50 or more, you can quickly arrange it by going to the nearest National Bank, State Bank or Trust Company.

They are all authorized to act.

They are all acting without profit to themselves.

They will explain the payment of interest, or anything else in connection with the loan which you want to have explained.

They will conduct the whole transaction for you.

WHEN our flag goes into action in behalf of human rights, the great majority of us, for one reason or another, will not—probably cannot—follow it in person.

We *can* follow it with our *support* to the very battle front.

That support can be shown now in no plainer way than by our promptness in loaning to Uncle Sam, according to our means, the funds that he now needs.

This is called the Liberty Loan. Both in sound and meaning, Liberty comes close to another word which should be before us now—*Liberality*. It is up to us.

There is a bank near you —And Uncle Sam is waiting

Liberty Loan Committee, Second Federal Reserve District, 120 Broadway, New York